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EDITORIAL NOTES—GAS, &c.

Gas Charges and Meter-Rents.

A SHORT time since we were pointing out in the leader columns how the charges for gas in London and the suburbs were, as time passes, drawing closer to the point of uniformity; but it has since been suggested—not by anyone associated with any company mentioned in the article—that it would be fairer in comparisons to take the average charge for gas *plus* the average (per 1000 cubic feet sold) of the sum obtained by way of meter-rents, inasmuch as these vary considerably, and so cause a marked difference in the amount paid per 1000 cubic feet by the consumers. But in making comparative calculations of this kind, we find complication is introduced by some companies including fittings in the sum under the head of meter-rents, while others do not. For instance, if we turn to the last issue of Field's Analysis, it is observed that, among the Suburban Gas Companies, the two concerns receiving the highest meter-rent per 1000 cubic feet of gas sold are the Brentford and the Wandsworth—the figures being respectively 2·86d. and 3·32d. But in both these cases meter-rents, a footnote informs us, "include the rental of fittings." Yet there are sufficient figures available to show that there is something in what is claimed, as to the amount of the meter-rents making an appreciable difference in the average sum taken from consumers per 1000 cubic feet, and as to regard being paid to this in making comparisons between one company and another. This is readily seen by three or four examples.

The Board of Trade returns and Field's Analysis do not bring the statistical and analytical record any nearer to date than 1909, since which year there have been reductions in price which have again altered the position, and which make the figures we are now quoting simply illustrative of the point raised. In that year the Gaslight and Coke Company were charging for gas an average of 32·01d. per 1000 cubic feet sold; while the Commercial Company were charging 29·21d.—a difference between the two Companies of 2·8d. per 1000 cubic feet. But the larger Company were only charging an average of 0·61d. for meter-rents, against 2·39d. by the Commercial Company. Taking this into account, the difference between the two Companies was not 2·8d., but only 1·02d. The South Metropolitan Gas Company in the average price of gas alone (25·85d.) were lower than the Gaslight and Coke Company by 6·16d. But the average charge levied for meter rents by the South Metropolitan Company was 1·46d. per 1000 cubic feet, against 0·61d. by the Gaslight and Coke Company; and thus we get the difference between the two reduced from 6·16d. to 5·31d. The difference in 1909 in the average charge for gas between the South Metropolitan Company and the Commercial Company was only 3·36d.; but the lower meter-rent of the former made, adding the two charges together, the difference 4·29d. per 1000 cubic feet.

Take a further example or two from the suburbs. The South Suburban Company in 1909 charged an average of 29·14d. for gas, against the Tottenham Company's 28·38d. But if we add to these average prices the average charge for meter-hire—0·96d. in the case of the South Suburban Company and 1·97d. in that of the Tottenham Company—the consumer was, on the average, actually better off under the South Suburban Company by 0·25d. per 1000 cubic feet. If we take the figures of the Richmond Company for 1909, and compare them with the Mitcham Company, it would be unfair not to give the former the benefit of the lower average received from meter-rent. In the year just named, the Mitcham Company received an average for gas of 35·79d. per 1000 cubic feet, while the Richmond Company obtained 33·15d.—a difference in price of 2·64d. But inasmuch as the Mitcham Company received an average of 2·33d. by way of meter-rents, as against 1·16d. in the case of Richmond, the total difference in the average receipts per 1000 cubic feet (including meter-rents) was really 3·81d.—that is the average amount that the Richmond consumers paid less than those of the Mitcham Company. If we turn to the Provinces, the same thing is found. Among the Companies charging meter-rents, and one of the five charging on the very lowest scale, is the Cheltenham—their commencing rental being 1s. per annum for a three-light meter. This and the Gloucester Company work on very close lines; but it is seen again in this case how meter-rents may influence the comparison of the average charge per 1000 cubic feet taken from the consumer. In 1909, the charge for gas in Cheltenham was 2s. 1d.; while in Gloucester it was only 1d. more—in both cases subject to discounts. The average price obtained for gas per 1000 cubic feet sold in the case of Cheltenham was 24·20d., and in that of Gloucester 25·52d.—a difference of 1·32d. But if we take the average receipts for meter-rents per 1000 cubic feet in these two towns—respectively 0·99d. and 1·49d.—we have the difference extended in favour of Cheltenham to 1·82d. The same thing is found all over the country. It all goes to show, what is so generally known but so commonly ignored, that in considering differences of price, variations of meter-rent should be taken into the calculation.

While looking into this subject, one cannot fail to be struck by the curious divergencies exhibited by the Board of Trade returns in the matter of the meter-rents levied throughout the country. Take the smaller sized meters only—two, three, and five light ones—the commencing charges in the case of the statutory gas companies (where any charges at all are made) vary between 1s. and 8s. per annum, and some of the charges between are so curiously odd that one is at a loss for a reason as to how they came to be settled, other than by some freak. Certain it is, however, there is no common basis for determining meter-rents. A charge of 4s. per annum for the small sized meters appears to be the most approved one—no less than 175 statutory companies favouring the figure. A long way in the rear as second come 78 companies with a 3s. charge; and 49 companies run third with a charge of 2s. Charges are as erratic as the numbers of companies adopting them. From 2s. we jump up to 5s. and 6s. for the next highest numbers of companies with those charges as their commencing ones for meter-hire. The numbers are respectively 32 and 27. Then we drop down to 2s. 8d. [why 2s. 8d. per annum as an initial rental?] for the next highest number of companies—24. Then we have eleven with an initial charge of 3s. 4d.; seven, 2s. 4d.; six, 1s. 4d.; five, 2s. 6d.; five, 1s.; three, 1s. 8d.; and one each of 1s. 6d., 3s. 6d., 4s. 4d., 4s. 6d., 4s. 8d., 5s. 4d., 6s. 8d., and 8s. It is certainly a singular medley of charges for the lower sizes of meters.

A little more diversity is introduced into practice by 25 companies who charge 10 per cent. on the cost of the meter; another company charge 7½ per cent., while two companies charge 5 per cent. But a little more is secured by the concern that charges 12½ per cent. on "the retail price of "the meter." The South Suburban Company are content with 3s. per annum for all sizes of meter; the Brotton Company's rents average 5s.; the Guisborough Company charge 4s. 6d. irrespective of size. The Calne Company supply meters up to ten lights for 2s. Only two companies make the charge dependent on consumption. The Banbury Gas Company charge 2s. if the consumption totals to less than £10 per annum; and no charge is made if the account is above. The Waterford Gas Company, too, charge at the rate of 4s. if the gas accounts are less than 10s. a quarter. A free and easy rule is applied in the case of the Oakham Gas Company—the charge in their case being at the rate of 1s. per light per annum. We take this to mean that a three-light meter would be charged 3s., a five-light one 5s., and so on. In the case of the Slaithwaite Gas Company, meters are supplied free for stoves and engines. Twenty companies furnish meters for any purpose free of expense to

the consumer; while the returns show that five companies —viz., Frome, Littleborough, Milnrow, Ramsbottom, and Whitworth Vale—prefer that meters should be provided by the consumers. It is a singular arrangement; and in these competitive times, one may be pardoned for failing to see the wisdom of, or where the advantage can accrue from, making the consumer provide the means of measurement. It must be a considerable obstacle to business progress.

Excessive Calorific Power Standards.

Because standards of calorific power are being introduced but slowly in the world's gas industry, the British gas profession must not neglect the trend of events and the omens in this direction. The standards that have originated in London, in America, and now in Paris are influential; and though we do not anticipate any sudden supersession of the illuminating power test, when a change is definitely made here, the application, we feel, may proceed with a little more rapidity than will be comfortable for those who have not in these times heeded the portents from various quarters. Paris has thrown over illuminating power as the standard of the quality of gas, and has adopted a calorific standard equivalent to 522 B.Th.U. net—corresponding to about 566 B.Th.U. gross. This having happened in Paris, it is easy to foresee what will, ere many years have passed, occur in regard to gas supply throughout France. But there are two objectionable features about the standard that has been applied in Paris—the one is that it is too high, and the other that the net calorific value of the gas, instead of the gross, has been adopted. We need not say anything about the latter point, inasmuch as—although in the case of the Gaslight and Coke Company the net value was adopted in the agreed calorific standard—it is almost universally held by the calorimetrists of this country and of America that there is less chance of error by standards being based upon the gross and not the net figures.

But as to the other point—the height of the standard adopted—that is a more serious question; and it is in this connection that there must be a stiffening of backs with calorific power rising above the horizon as the property of gas that is in future to determine quality. It has been one of the notable features of the calorific standards so far applied that they have all been in excess of need; and this Paris standard comes to accentuate it. A calorific standard that is pitched too high—though calorific power is more easily maintainable than illuminating power—can be an autocratic force, and antagonistic to contemporary gas economies. The standard of the Gaslight and Coke Company —125 calories per cubic foot, less 10 per cent., making 112½ calories, or 450 B.Th.U. net—is really too high. Taking the average of the results of the tests last year, the Company managed to keep within the lines; but the minimum of 450·4 B.Th.U. found them sailing very close to the wind, though the average was as high as 491·6 B.Th.U. But without the 10 per cent. allowance, the Company could not possibly, without waste, have complied with the standard. As it is, they are not working under the most economical conditions, seeing that, though their parliamentary illuminating standard is 14 candles, tested by the "Metropolitan" No. 2 burner, compliance with their calorific terms last year was only purchased by the supply of gas of an average illuminating power of 15·22 candles. If the Gaslight and Coke Company find a net calorific value of 450 B.Th.U. net gives them no margin, and is incompatible with their illuminating power standard, the Paris Gas Company will not be particularly happy under their standard of 522 B.Th.U. net; and the £32,000 to £36,000 formerly spent on benzol enrichment will not be all saved, through the useless level at which the new net calorific power standard has been placed. Plainly, the ruling powers and industrial and practical considerations are not occupying a common platform in fixing standards of calorific powers. In America, there has been still greater despotism shown. The standard in the State of Wisconsin is 600 B.Th.U. as the monthly average, with a minimum of 550 B.Th.U.; and the State of Indiana also requires cities of the "first class" to supply gas of 600 B.Th.U. In a few other States, in which both an illuminating power standard and a calorific power one obtain, the calorific power conditions vary between 570 and 633 B.Th.U. The only redeeming feature is that these American figures are gross values, and not net ones. But they all point to the same thing-- the inclination of the authorities to as high a calorific power standard as possible.

Important as is calorific power, apposite as it is as a standard for gas (being more concordant with the day's practical uses than illuminating power), local and other authorities must treat circumspectly the matter of the degree of the standard that they desire to impose, lest, by putting the standard too high, they introduce a requirement that is in antipathy to the conditions necessary for the best and the cheapest gas service. This is a point that is made by M. André Grebel in an article appearing elsewhere in this issue, entitled "The Passing of the Illuminating Power "Test." M. Grebel is as fully persuaded as we are that the standards hitherto imposed are too high, regarded from all economic standpoints; and he states his reasons for so thinking, with which reasons we are in the fullest sympathy. But while not lessening the case for a moderate calorific power standard, it must be said that his point of observation is not so broad as ours. In this country, it is not only the use of gas in incandescent burners that has to be considered, but when 40 or 50 per cent. of the gas distributed in some places is used in the daytime for purposes other than illumination, and when a proportion of the remainder is also consumed for cooking, heating, and power purposes when daylight has failed, the balance has to be held very carefully in order not to injure the interests of users of gas for purposes other than illumination. The capital point in M. Grebel's case is that a high calorific power gas is not essential to the high efficiency of the incandescent burner. So long as attention is confined to coal gas pure and simple, he is at one with M. Sainte-Claire Deville in saying that it is, approximately, a good thesis that the lighting power of gas produced by incandescence is proportional to its calorific power; but he contends that it is utterly fallacious when applied to gases other than coal gas.

Chemical constitution of the gas also plays an important part in producing mantle efficiency; and he shows, as Mr. Arthur Forshaw was doing in the paper he read before the Institution of Gas Engineers in 1909, that carbon monoxide is highly favourable to incandescent lighting. If one is right in accepting this conclusion, it follows that a calorific standard placed too high will have a dual detrimental effect. In restricting the use of water gas, it will automatically do as much as, if not more than, any rigid prescription as to the proportion that may appear in the mixture, and it will simultaneously restrict a constituent that is serviceable in obtaining a high mantle efficiency. Furthermore, it will confine the dealings of gas undertakings in the matter of their raw materials. M. Grebel hits straight out from the shoulder when he says: "It is "difficult to understand the policy of arrogant bureaucracy, "which restricts the addition of water gas, methane, or "hydrogen, since these gases furnish excellent results with "incandescent lighting—better even than coal gas itself." But upon all the argument against a high calorific standard, M. Grebel recommends a minimum net calorific power not exceeding 4400 calories, which is equal to 500 B.Th.U. net. This is a figure that our London conditions, in connection with the Companies using a mixture of coal and carburetted water gas, do not justify. Therefore, while in accord with M. Grebel's argument generally, circumstances compel us to take a broader view than he does, and to suggest a lower calorific standard, sufficient reasons for which he himself advances.

Results at Manchester.

The figures that the Manchester Gas Committee have produced as the outcome of the working of the undertaking last year, despite the character of the efforts put forth by the Electricity Department, fully warrant the congratulations that Alderman Gibson has paid to Mr. J. G. Newbigging, the Chief Engineer, and Mr. F. A. Price, the Superintendent of the Department. We are acquainted with no one who knows better than Alderman Gibson when a compliment is deserved, nor anyone who knows better how to round off the expression of the compliment so as to make it convey a full measure of sincerity. The surplus on the year's working —£89,816—is more than double the estimate made a year ago. The excellence of the residuals markets contributed substantially to this; but what was done in them was supplemented by the profits represented by the economies on the works and the additional gas business in the district. The higher make of gas per ton of coal carbonized—11,342 cubic feet, compared with 11,034 cubic feet—has resulted in 5366 tons of coal less being used in the year, though the output of gas was greater by 94½ million cubic feet. Men

of the commercial calibre of Alderman Gibson and his colleagues do not see any necessity for spending time in peering about among side-issues to see whether they cannot discover something with which to scratch some of the gilt off plain figures of the kind, which, in this instance, represent a saving on coal of about £6000, an additional income from gas, and increased profits. There is not much room in the industrial world in which Manchester men live for those who contend that it is false economy to make more of the prime commodity from the raw material used, and to save money on the latter, seeing that it will result in a smaller quantity of secondary products being available for disposal. The accounts at Manchester, as in many other places, do not subscribe to the strange theory.

The only regrettable feature about the improved surplus is that the city is looking to the Gas Committee to contribute in the current year, as they did in 1909, £50,000 in aid of the rates, or £3500 more than last year—an addition to which the cost of street lighting has been reduced by £3356. This means that the gas consumers are to pay still more towards the discharge of the financial obligations of the city than those ratepayers who are not gas consumers. The Electricity Committee are going to increase their contribution to £19,496 (it was £15,000 last year); the £19,496 being equal to 1 per cent. on the outstanding indebtedness of the electricity undertaking. The Committee are to be admired for adopting this basis, which Parliament proposed to apply to Salford gas profits before the Salford Corporation beat a hurried retreat from Westminster. But why did not the Manchester Electricity Committee go one better, and adopt the ruling of Parliament in the Glasgow case? In that, Parliament said the Corporation should not be allowed to touch a pennypiece of the gas profits in aid of the rates. If the Manchester Corporation consent to allow the Electricity Committee to rigidly limit themselves to a contribution of 1 per cent. on the outstanding debt, the Gas Committee will have to consider their position in the matter. What is the proper procedure in the case of one Committee must surely be right in the case of the other. There cannot be separate lines of financial policy in two undertakings under one administration, and both lines be correct.

A Reduced Illuminating Standard for Preston.

In the case of the Preston Gas Order, the Board of Trade have once more signalized the appreciation of the parliamentary authorities that high-power illuminating gas is out of date, and that a 14-candle standard, using the "Metropolitan" No. 2 burner in testing, is in accordance with the times and the progress that has been effected in gas appliances. But there is still that sentimental defence, or rather attempted defence, of those who continue to live in a past age in the matter of illumination. The Corporation of Preston appeared before the Board of Trade in March pleading for them; and there was the retinue of witnesses who have suffered defeat in many a parliamentary fight over this very matter giving the Corporation the best possible support they could offer. It was all no good. History repeated itself. Fourteen-candle gas and the "Metropolitan" No. 2 burner are retained in the Provisional Order as it will be presented to Parliament for confirmation. It was only upon this question of illuminating power that the Corporation of Preston opposed. Their leading Counsel told the Hon. T. H. Pelham that he did not challenge the merits of the new test-burner. "I am here to oppose any reduction of the illuminating power. That is all my instruction, and that is what the Corporation want." Therefore, upon the main point, the Corporation did not succeed in putting an obstacle in the only path that is open to the Company to render better service to Preston under the modern improved methods of utilizing coal gas. We cannot believe the Preston Corporation were fully acquainted with the position of the applications of gas to-day, and with the greater suitability under current conditions of use of a lower grade in illuminating power than that which has up to now been supplied in Preston; nor can they have been completely informed as to how consistently Parliament has the past few sessions endorsed the march of the gas industry towards the supply of a commodity appropriate to the progress achieved by scientific invention. Perhaps they have come to the conclusion now that they have been before the Board of Trade that their information was at fault. What, we may ask the members of the Corporation who gave instructions to their leading Counsel to oppose any reduction of the candle power of the gas, is the good of scientific invention, if, by perpetuating something that is repugnant to that invention, we are going to deprive ourselves of the full benefits and economies? It is difficult to reconcile the attitude of the Preston Corporation with the traditions for progress of which they are indubitably proud.

The Gas Company have perhaps been a little remiss in making a forward movement; but there is greater cause to sympathize with, than to censure, the present management. It is admitted that the Company have a weight of obsolete capital, left from the past to impede movement in the present when the utmost activity is demanded in the open field of competition. Mr. Pelham saw this; and he has (though no request was made in the Order) introduced a clause providing for the redemption of £100,000 of the obsolete capital by appropriations from undivided profits in excess of the requirements for the standard rates of dividend. This, coming upon the Gaslight and Coke and the Brighton precedents, is an important matter—not only for the Preston Company but for other concerns carrying a burden of obsolete capital. It will be seen from this, from the reduction of the standard of illuminating power from 18 candles to 14 candles, and from certain of the statements made during the proceedings at the Board of Trade inquiry, that the Preston Company are in an exceptional position; and this will account for the reduction of the standard price to 3s. 4d. No doubt the opponents will claim this as a victory resulting from their opposition. But the "victory" is not particularly discernible. The leading Counsel for the Corporation (let us repeat) avowed that his instructions were only directed to opposing any reduction of illuminating power. However that may be, it is easy to discount any *kudos* that may be claimed in connection with the standard price. The standard price clause in the Company's Act of 1894 was a singular piece of enactment. The prices of 3s. 10¼d. to 3s. 5½d. were mentioned as the "standard." But the Company have only paid the standard rates of dividend, of 10 and 7 per cent. respectively on the "A" and "B" capital. Moreover, they voluntarily offered 1½d. off the standard price, and a reduction of the selling price by 3d., if the lower illuminating standard were allowed. The Company, in fact, were willing (their Engineer and Manager, Mr. Samuel Tagg, told Mr. Pelham) to give the consumers the whole of any savings effected through the reduction of the illuminating power. Thus, the circumstances were peculiar; and nobody apparently will be one penny the worse for the typographical change to be made in the standard price. Certainly, the opponents cannot make much ado over it.

It is also observed that the Company are to provide any consumer who desires them with flat-flame burners suitable for the lower illuminating power gas. The proposal to insert the words "for illuminating purposes" in the public lighting clause in the Company's Act of 1865 has been deleted. We are sorry for this, as no one can submit that the conditions of half a century ago, when the clause was put into several Acts, have any congruity with the conditions of to-day. In dealing with such an amendment as that put forward by the Preston Company, there ought to be regard for the circumstances that existed at the time the clause was originally passed.

Coalite Confessions.

As plainly as is decent or respectful, the Directors of the British Coalite Company tell the shareholders in the report that is to be presented to them to-morrow that they have from the beginning of the history of this concern been duped—we do not say deliberately, but through ignorance, and through an unjustifiable exuberance on the part of those responsible from its inception to the stage at which it stood (let us say) last July, when the new Managing-Director (Mr. Herman Clarke) took charge. This gentleman now expresses a beautiful faith in the process that is only equalled by the sparkling faith of those who have one by one left the wrecked ship, voluntarily or by force of circumstances. We see that the pressure of engagements has compelled Sir Charles Allen and Sir William Bailey to relinquish their seats on the Board. The question crosses the mind as to whether, if that rich golden harvest predicted some time since had been in the reaping now, the "other engagements" of these gentlemen would have necessitated their retirement from the direction of the Company. Anyway the shareholders will regard it as most unfortunate that the pressure of business engagements should have synchronized with

the miserable conditions under which they are meeting; and they will likely suspect that Sir Charles and Sir William have had enough of coalite to last them the rest of their days. The information with which the Directors come before the shareholders is that all that has been done in the past, techically and commercially, has been wrong, and there is on the working (it is understood) a deficit to date of £100,600. There has indeed been much capital squandered by those who have been year after year wandering in search of a new Pactolus; and yet more money is wanted for further experiment at Barking. This is a pretty state of things for the shareholders; and, at the meeting to-morrow, it may be expected there will be some plain talking. What it comes to is this: All that has been done in the past is acknowledged to have been useless, and so has been abandoned; and the Directors ask to be allowed to make a fresh start, on the advice of the Managing-Director, who was imported into the "business" as recently as last July, and who, with the concurrence of the Directors, has shut-down all the stations excepting Barking, and has effected several economies. Among the latter is the greater part of the enormous annual loss entailed by expenses of the executive staff, technical advisers, and experts, who together were costing between £30,000 and £40,000 a year. It will be interesting to hear what the shareholders think of the combined efforts of the staff, technical advisers, and experts on their behalf. The question now is, What have the Company left?

A New Temperature Point.

There is the site at Barking, with plant upon it that must be reconstructed. There are the "patents." Will Sir William Preece tell the shareholders to-morrow what are the differences between the new plant that it is proposed to put down (if anyone can be induced to find the money for it) and gas-works plant, and what is the difference between the methods of operation upon which any justification for a monopoly can be established—remembering the low-temperature experiences of the past of the gas industry, and what the latter are doing with high temperatures to-day? The Managing-Director speaks mysteriously of some temperature point (which he will not divulge) which is going to do the "trick." We fancy that during the century and more of coal carbonization by the gas industry, there is not a temperature point in coal carbonization that has not been used many a time. We hardly think Sir William Preece will venture to make any absurd claim as to a monopoly of coal carbonization at any particular temperature.

Another Warning.

The warning in connection with coalite that has been made in these columns in the past has been justified by the events; and scrutinizing all the Managing-Director now tells us in his report on the technical side of the position, we venture to submit that he himself furnishes sufficient information to warrant a repetition of the warning. It is quite clear that the whole basis of his present predictions, technically and financially, is composed of comparatively small experiment, mixed with a fair amount of hypothesis. To pave the way for the good news he thinks he has in store for shareholders, he informs them how they have been deceived in the past as to what the plants were doing. The saleable coalite produced was low; the breeze and waste high; an average of only 4000 cubic feet of gas per ton was produced; the tar was of low specific gravity, was full of sulphur compounds, and was rectified by such a crude process as to be almost unmarketable; and the sulphate yield was only about 9 lbs. per ton of coal. What have the staff, technical advisers, and experts (whose services and work are said to have entailed a loss of between £30,000 and £40,000 a year) to say to these changes? But, Eureka! Mr. Herman Clarke has, or he believes he has, in nine months discovered what they failed to discover in years—the design of plant and the critical temperature at which to carbonize.

Working Results Compared.

Under it he thinks he will be able to get from the coal 60 per cent. of saleable coalite, which he hopes to sell at £1 per ton. The 60 per cent. would be equal to 12 cwt. per ton. The gas industry obtains for sale about 11 cwt. of coke, and will be competing at a lower price. He tells us that he will get 6500 cubic feet of gas per ton of higher lighting and calorific value than the gas produced by the gas industry. This is interesting. His gas is said to be of 17-candle power; and therefore (on the 5 cubic feet basis) the 6500 cubic feet will be equal to 22,100 candles. The gas industry (according to the last Board of Trade returns) produced an average of 11,160 cubic feet of gas per ton; and it will not be amiss to take this as being of 15-candle power. Therefore (on the 5 cubic feet basis) this would be equal to 33,480 candles. The calorific power of coalite gas is stated to be 700 B.Th.U.; so that the 6500 cubic feet would be equal to 4,550,000 B.Th.U. The average gross B.Th.U. of London gas last year was 564 B.Th.U. Taking the before-mentioned 11,160 cubic feet per ton, this would represent 6,294,240 B.Th.U. The sulphate of ammonia that it is claimed the coalite plant as it is proposed to modify it will yield, will be 24 lbs. per ton, which falls short of good working in the gas industry. The coalite tar is said to be free from sulphur compounds and of a specific gravity which brings it into free competition with the tar distillates of gas-works.. As the plant proposed at Barking for the £50,000 is only equal to the carbonization of 300 tons of coal per day, the gas industry can afford to smile at the "free competition." On all grounds, comparison of coalite working at Mr. Clarke's mysterious temperature point with the method of working of the gas industry proves that the former does not come up to the economic standard set by the modern working of the latter. Mr. Clarke protects himself with the significant remark that "we have yet much to learn, and much to apply." In this he spoke wisely and well. It at all events shows that sanguine as he personally professes himself to be (after the manner of so many who have touched coalite), he has at the back of his mind the feeling that the process is not yet clear of the experimental stage.

Electrical Criticism.

An entertaining article has appeared in the "Electrical Review," composed of a number of extracts from the paper Mr. W. Upton recently read before the London and Southern Junior District Association, with a few puerile comments on the points. The "Review" can on occasion be extremely entertaining. We remember the ancient manuscripts it discovered some time since, testifying to the transcendent qualities of electric lighting over gas lighting; and, on inquiry, we found that the testimonials were of such antiquity that some of the writers had gone to their final rest. There was also the publication of the grotesque article by Mr. Percy Good, in which the question of the exhaustion of the atmosphere by gas was discussed, and certain (we will not use the adjective deserved) foolish suggestions were put forward. There were the repeated imaginings of the editorial brain as to the ghastly sacrifice of human life through the use of gas upon trains, on which point Major Pringle has succeeded in restoring something like order. And now, the at one time dignified "Review" has pounced on a paper read before a Junior Gas Association! Mr. Upton, who has a somewhat breezy way of dealing with affairs, has no doubt smiled hugely to see how very seriously the "Electrical Review" has taken his remarks, and quoted him as a "high authority." In the wildest flights of his imagination, Mr. Upton (who has not been in engineering or managerial charge of a gas undertaking in this country) has never harboured any idea that anyone would gravely regard him as a high gas authority. If the editorial writer of the "Review" had known our friend, and had been able from intimate knowledge of the subjects dealt with to apply the necessary qualifications to the remarks in the paper, he would have saved himself from stupid blundering. Let us take only one point. Mr. Upton spoke of the evils of varying gas pressures. Every responsible gas engineer throughout the country is as alive as is Mr. Upton to the necessity of constant pressures in these days of inverted gas-burners and gas-fires; and, excepting those who are negligent, they have been acting accordingly. Let the editorial writer of the "Review" lift himself from electrical banality in connection with this subject for a space of time brief enough to ask himself the two sensible questions: How was it that Mr. Bradley in his Westminster tests (*ante* pp. 156, 183), carried on over three months, got such excellent results with the inverted burners fed at ordinary district pressures? How is it that, if gas-fires refuse to incandesce in the morning and indulge in "cheerful roaring" in the evening, there has been such a remarkable boom in them continuously the past two or three seasons? Do not think we are claiming perfection for gas. All that is being suggested is that the exercise of a little commonsense and something more than superficial examination is excellent on the part of one who wields the pen in criticism and comment.

Urban District Council Finances.

When dealing with the financial transactions of Urban District Councils, as set forth in Part VI. of the Annual Local Taxation Returns, one misses the items which appear in the summarized accounts of the Borough Councils showing the sums, in connection with "reproductive" undertakings, that were either handed over in relief of rates or had to be allocated to make good deficiencies in revenue of trading concerns. In other respects, the statistics (some notice of which for the year 1908-9 will be found in another part of this issue) are on similar lines—though, of course, the amounts involved are smaller than in the case of the boroughs, which were the subject of an article in last week's issue. It is gathered from the present Blue-Books referring to these bodies that at March 31, 1909, there were 327 boroughs (exclusive of the Metropolis), while the number of urban district councils was 815; but while the rateable value of the former was £75,317,035, that of the latter was no more than £33,894,915. An even greater difference is encountered when the total amounts of the loans outstanding in the two cases are compared. Whereas for the borough councils the figure is over £250,000,000, for the urban district councils it is only about £36,500,000. In both instances many items comprised in these loans are the same. But looking now only at the accounts of the urban district councils, it will be noticed that, of the total amount owing by them, 23·4 per cent. is for purposes of sewerage and sewage disposal, 15·1 per cent. for water-works, 9·6 per cent. for gas-works, 10·8 per cent. for education, 8·8 per cent. for street improvements, 6·7 per cent. for electric lighting, and 5·8 per cent. for tramways and light railways. Altogether the loans outstanding in respect of undertakings which yield revenue and for works of private improvement (and which amount is recoverable) represent, in the case of the urban district councils, some 40 per cent. of the total debt. Of the receipts of these councils for the year 1908-9, the amount raised by means of public rates accounts for 54·4 per cent.; the receipts (quite apart from all question of profit) from the principal revenue producing undertakings and private improvements representing rather less than 24·4 per cent. of the total income. A remark which has been referred to on previous occasions is, it is gratifying to see, repeated in the Blue-Book now dealt with—namely, that "in recent years there has been a distinct slackening in the rate of increase of the debt of the urban district councils." In the five years to March, 1909, the increase was no more than £4,182,610, or 12·9 per cent.; whereas in the five years to March, 1905, the growth was £12,638,047, or 60·1 per cent. This is a satisfactory reduction. Of the £4,182,610 added to the outstanding loans in the past five years, electric lighting has been responsible for £366,193; and tramways, for £759,115. In the same period, the outstanding loans on gas-works have increased by merely £31,318; and those on water-works, by about £132,000. The average amount in the pound of the rates received by district councils (other than for purposes of elementary education) in the year 1908-9 was about 3s. 2¾d. in the pound; but, in addition to this, elementary education was responsible for a rate of 1s. 4¾d. in the pound in the districts in which a rate for this purpose was levied.

Independent Labour.

The information was given by the Chairman (Mr. W. C. Anderson), at the annual conference in Birmingham of the Independent Labour Party, that the General Election in December left the party, in point of parliamentary representation, at the highest water-mark yet reached; while in the domain of local government, also, they have distinctly improved their position. Not only did they increase their representation in municipal councils in November, but in the recent contests for the urban district councils between forty and fifty net gains were scored by Labour and Socialist candidates. In Great Britain, we learn, Socialism is spreading and maturing; and from this the Chairman led his hearers to expect much benefit. All "barriers" to the "on-coming of Labour" will be broken down. Not only will the Osborne judgment be reversed, but out of evil good will come, and such re-arrangements be made as will "permit poor men to enter Parliament and serve the State on terms approaching equality with the rich." Continuing, the Chairman said it was now admitted by statesmen that incomes were of two kinds—earned and unearned—an ominous and valuable admission of which more would yet be heard. They saw State money set aside for such purposes as afforestation and land reclamation; small holdings established on the basis of public ownership; Commissions reporting favourably on State schemes of afforestation, or on railway nationalization in Ireland; and Parliament affirming the right of legislative interference with the hours of adult males and the wages of sweated workers. All these enactments and readjustments, he said, bore testimony to the development of new and wider conceptions of the functions of the State; for the bulk of those legislative changes really represented tributaries that were feeding the main streams of Socialistic tendency. This assertion is worth making a note of by those—if any there be—who are still in doubt as to the direction in which things are now drifting. In the course of the subsequent proceedings of the conference, a resolution was passed urging the Labour Party to strenuously resist any attempt on the part of the Government to compromise on the question of the veto of the House of Lords, and instructing the Independent Labour Party members of Parliament to vote in favour of the abolition of the House of Lords, and against a second chamber being formed. Municipal matters were also considered; a motion being agreed to declaring the opinion that the time is ripe for a comprehensive scheme of local government reform, conferring larger powers on the local authorities to enable them to embark upon "undertakings for the supply of any of the wants of the people in their respective areas, or for the rendering of any public service whatsoever." There seems no danger at present of the Independent Labour Party fading away for want of a programme to keep them alive.

PERSONAL.

Mr. J. KINCAID, who has been Manager of the Kirkcaldy Gaslight Company, Limited, since 1903, has been, by the unanimous vote of the Corporation of Kirkcaldy, retained in the position of Manager of the gas undertaking.

Mr. LEWIS MITCHELL, Water-Works Engineer to the Bolton Corporation, has been selected (out of 86 applicants) for a similar appointment with the Aberdeen Corporation. Mr. Mitchell is considering the offer from the "Granite City."

Readers of the "JOURNAL" are aware that Mr. JAMES W. HELPS, the Engineer and General Manager of the Croydon Gas Company, was early in the year granted leave of absence by the Directors, to enable him to go away for a rest, as his health had been somewhat impaired as the result of overwork. We learn from a letter received from him yesterday that he has returned feeling very much better for the change, and has resumed his duties. He was accompanied by Mrs. Helps, and the principal portion of the time was spent either in Algeciras or Ronda; but they paid many visits to Gibraltar, and stayed in Granada, Cordova, and Seville. They were also able to go for a short time to Tangiers. We are sure that the many friends of Mr. Helps will be pleased to learn that the respite from work which he was able to take has been beneficial.

RETIREMENT OF MR. H. D. ELLIS.

WE learn that Mr. Hubert Dynes Ellis, the Secretary of the Commercial Gas Company, will relinquish this position at the close of the present month, and become a member of the Board. Mr. Ellis has been nearly thirty-two years with the Company; having been appointed in December, 1879, in succession to Mr. E. J. Southwell, who died towards the close of that year, and who had been Secretary since the death of Mr. George Jaques in 1876.

During his connection with the Commercial Company, Mr. Ellis has been associated with three generation of Engineers—Mr. Robert Jones, Mr. Henry E. Jones, and Mr. Stanley Jones. He is Chairman of the Oriental Gas Company (having recently succeeded Mr. R. Hesketh Jones in this capacity), and Deputy-Chairman of the London and Blackwall Railway. He also holds an interest in a number of gas undertakings. Apart from his professional work, he endeavours, as a member of the Royal Borough of Kensington, to render service in the management of the municipal affairs of the district in which he resides.

We trust that, relieved of his present duties, he will continue to enjoy for many years the good health with which he has hitherto been blessed; for on the occasion of the half-yearly meeting of shareholders in August, 1909, he stated, in acknowledging a vote of thanks, that that was the sixtieth occasion on which he had had the pleasure of similarly responding, and that, during the whole of his then thirty years' connection with the Company, he had never been absent a single day on account of ill-health—a remarkable record which has not since been broken.

Mr. F. J. Bradfield, now the Accountant of the Company, succeeds Mr. Ellis in the secretaryship, and—last, but not least, among the changes to be recorded—Mr. Stanley Jones has been appointed General Manager as well as Engineer.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 250.)

THE march of events on the Stock Exchange last week was distinctly disappointing. The previous week, the general tendency had been almost ardently buoyant; and at the close for Easter, most people were looking forward to an opening on the Tuesday with unimpaired, if not enhanced, strength. But a rude rebuff awaited them; and as a result the advance in prices previously achieved sustained a considerable set-back. Various factors conspired to bring this about. The disturbance in Morocco, the Money Market, the Queensland loan, American railway legislation, and the alleged "over-bulling" of Home Railways, all had more or less a finger in the pie and helped to pull things down. The markets were slow in resuming business on Tuesday, and dulness soon manifested itself in places. Consols were quiet and unchanged. Rails opened with a show of strength on fine weather traffics, but fell back on sales to realize. Americans were weak. Business was far from active on Wednesday, and was dull. Rails were again sold, with falling prices; and Americans were very poor. Consols did not move. Thursday was rather more active; but the tone was no better. Government issues were dull, and Consols fell $\frac{1}{8}$. Rails were weaker; but Americans made a partial recovery. On Friday, things were still depressed. Consols fell again. Rails did likewise, though some final prices were better than the lowest of the day. Saturday was very quiet; fine weather and sporting distractions accounting for many absentees. The tone was still dull, but not threatening to worsen. The Money Market fluctuated; sharp demands being succeeded by ease. Discount rates hardened. Business in the Gas Market was only moderate in volume, and was quite devoid of any marked feature, beyond the quiet assured strength which has characterized the market for many weeks past. Very few quotations underwent any change; but the variations were all upward. In Gaslight and Coke issues, the ordinary was not very active, but was firm; all transactions being within the close limits of 105¾-106¼. In secured issues, the maximum realized 85¼, the preference from 101½ free to 102½, and the debenture 80 and 80¼. South Metropolitan was also quiet and unchanged at 119⅜ and 120¼. In Commercials, the 4 per cent. was done at 114½, the 3½ per cent. at 108½ free, and the debenture at 78 free. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 84½ and 85 (a rise of 2), South Suburban at 118½ free and 120, and Tottenham "B" at 115¾. On the local Exchanges, Liverpool "B" rose 1½, and Newcastle and Gateshead 1. In the Continental companies, Imperial was recorded at from 191¼ to 192¼, and European at from 19¾ to 20¼. Among the undertakings of the remoter world, Bombay marked 6$\frac{1}{16}$, ditto new from 5½ to 5$\frac{13}{16}$ (a rise of ¼), Monte Video 13$\frac{1}{16}$, Oriental 140 free, Primitiva from 7$\frac{13}{16}$ to 7$\frac{15}{32}$, ditto preference 5¼ and 5$\frac{11}{32}$, San Paulo 16, and ditto debenture 51.

ELECTRICITY SUPPLY MEMORANDA.

Make the People Talk—Overhead Distribution—A Poor Case and a Pittance of Information—Tests and Tests—Human Lives and Live Wires—Conversion and Perpetuation—Comparative Intrinsic Brightness—An Alderman on Air Consumption.

"EVERYTHING which can be done to induce the non-technical public to talk about electricity is a point in favour of electricity supply." Those are lines taken from an article that has appeared in the "Electrical Review," on "The Advantages of Publicity Work." With them, converting the term "electricity" to gas, we are in agreement *in toto*. This was shown in our editorial columns last week in dealing with the publicity movement in the gas industry. That is the thing in these days—make people talk about the commodity for sale. The advertising method that makes people talk and circulate the intelligence, thus doing a magificent and free service to the advertiser, is the most successful one; and the effects are cumulative. That is what the Gas Publicity Committee are proposing to try to effect by their advertising scheme. But they are not alone in proposing to do this. The electricity people are also keenly alive to the benefits of doing the same thing. They have had their Publicity Committee at work for some time; and the article in our electrical contemporary says that certain advantages have already accrued. The first is that the methods adopted have had a stimulating effect upon electricity undertakings; the second, that unsuspected wants of the public have been brought to light; the third, that publicity has brought electricity supply more on to a business basis; and the fourth, that it has promoted public discussion. The importance of these advantages—for the electricity industry—is great. We do not think that the gas industry is asleep, or that its business basis is defective—excepting in this matter of publicity; but the industry could do with the extent of its capacity for useful work being better known, and more talked about. There are those, however, who are advocating a still higher plane of publicity work on behalf of the electricity industry. The taste of what has been done has sharpened the appetite of some of the enthusiasts for more. Hence the repeated stirring up of interest in the matter. But we hope the extension of publicity work in the gas industry will not have one effect that the writer of the article in our electricity contemporary says it has had in the electricity industry. He says that "the effort to tell outsiders what could be done with electricity has crystallized the ideas of electricity supply officials." That is an awful effect of such effort. We do not want to see the ideas of gas men solidified in that manner; but we desire to see them kept in a condition in which they can be developed and propagated.

Mr. W. B. Woodhouse, the Manager and Engineer of the Yorkshire Electric Power Company, has been reading a paper before the Yorkshire Section of the Institution of Electrical Engineers, on electricity supply for country districts. The big electric power companies want all the scraps of business they can get, because though at one time they thought they were going to become sufficiently powerful to electrically rule the land, their hopes and anticipations have not been realized, and financially most of them have been failures. Well, Mr. Woodhouse's paper was a plea for overhead wire distribution, instead of underground wires, in country districts. But his argument is not particularly convincing. He endeavours to show—we do not say he proves—that electric lighting and other applications are very cheap in country districts. That being so, there can be no necessity for saving the little difference between the cost of an overhead distributing installation and an underground one. If 80-candle lamps can be supplied for street lighting for 2000 hours for £2 a year and cottages can be lighted for 15s. to 18s. per annum, surely such conditions at once cut asunder all argument for damaging the picturesqueness of the countryside by overhead wires, and introducing the danger. It is certainly worth another 1d. per unit to the inhabitants to keep the electric wires out of sight and out of harm's way. In an estimate for lighting a village street a mile long by overhead wires and underground mains, Mr. Woodhouse puts the respective capital costs at £440 and £760—showing that the underground mains cost about 75 per cent. more; and though this difference is said to be represented by only 1d. per unit, he asserts that the overhead system is the only way by which electricity in country districts can be supplied at a cheap rate. But as so few units are said to suffice for the work to be done, what matters the additional 1d.?

The information is given by Mr. Woodhouse that the contract for the public lighting of Horsforth by his Company included the provision of the necessary mains, the conversion of the existing gas-lamps, lighting (presumably for 2000 hours), cleaning, and extinguishing for £2 per annum. The reports before us do not inform us whether the £2 includes renewals. The lamps are reputed to be of 81-candle power; and if they are run only 2000 hours a year (and not the 3940 or so for all-night lighting), and the charge is only 1½d. per unit, the consumption of current per lamp would be upwards of 200 units per annum, which, taking the round figure, would (at 1½d. per unit) amount to £1 5s. In another part of the paper cleaning, renewals, maintenance, and interest are put down at 15s. 3d. per double 35-watt metallic filament lamps (50-candle power the two, and not the 81-candle power included in the £2). On these figures, more information is required to ascertain how Mr. Woodhouse is able to supply at a profit [?] 81-candle power lamps for £2 per annum. Looking at experiences elsewhere as to actual costs for much larger installations, there is something missing in the particulars. The difficulty in this matter of street electric lighting is to get the actual costs and charges. We do not think it necessary to take up space in discussing Mr. Woodhouse's cottage lighting with only two lights per cottage; and using in certain cases 18s. and in others 15s. 1d. worth of current in a whole twelvemonth, at 4d. per unit. It is an insult to cottagers to ask them to be content with such "lighting." If the lighting hours were taken at only 1000 (the price does not include anything for installation and lamp renewal), the figures would merely allow respectively the use of 54 and 45 watts per hour. Poor folks! Electrically considered, anything is good enough for them. With 2000 cubic feet of gas used in the same time, with inverted burners, and costing considerably less than the figures named, they could enjoy a light of 40 to 50 candle power.

Reverting to street lighting, Mr. Woodhouse tells us that in the neighbourhood of the 81-candle power electric lamps, some photometric tests have been made of single incandescent gas lamps when "new," and single incandescent lamps when "old." We should like to know what he means by "old." The lamps were giving 68-candle power when new. We are not favoured with any particulars as to the gas consumption nor the style of the lamps; but when old, the lamps only gave 35-candle power! If these were the same lamps that exhibited a falling off of nearly half of their candle power, they were not receiving proper attention. It is one of the peculiarities of incandescent gas-lamps that, when tested by electrical partizans, they never will show up so well as when tested by independent men. It is a phenomenon that requires investigation. As was seen from our editorial and news columns last week, Mr. J. W. Bradley, the City Engineer of Westminster, over three months' testing, found inverted gas-lamps, from which only 90-candle power was required, gave an average of 132 candles. In the Holborn tests recently, it was found that using gas-lamps of 318-candle power and electric lamps of 395-candle power, "the lighting, down the centre of the roadway, was superior by the former." Altogether, Mr. Woodhouse makes out a very poor case for overhead electric transmission for country districts. What with telegraph, telephone, and tramway wires in our cities and towns, we can do without seeing overhead wires for electricity distribution in the country. In our cities and towns, there is a tendency now to get as much of the wiring as possible underground on account of safety in bad weather.

Overhead wires have just been responsible for the loss of three

lives in the neighbourhood of Kiel. The accident occurred last Wednesday week during a storm, in the course of which (the Berlin correspondent of a morning contemporary states) four of the standards supporting the wires which convey electricity to a farm were uprooted, and the line hung down close to the ground. A number of Russian Poles, employed on the estate, passed the spot on their return from work in the fields. A lad took hold of the wire to push it to one side, and was killed on the spot. Immediately afterwards a man put out his hand, also with the object of removing the obstacle. A female labourer, who had witnessed the fate of the boy, clutched at him to hold him back, but she was too late. He touched the wire, and instantly both of them fell dead. We are afraid the Board of Trade regulations regarding overhead wires in this country cannot offer any positive guarantee against accidents any more than can those applying to electric railway traction.

When local authorities have possession of electricity undertakings, and change over the public lighting from gas to electricity, ever more they hold the ratepayers in the hollow of their hands in the matters of the character of the street lighting, and of the charge they choose to impose for it. There is no wriggling out of it in any way. The excuse always is: "We have sunk so much money in electric street lighting that we must continue it now. No matter the improvements that are made in gas lighting, there can be no more competition between it and us. We have put such an amount of capital round the ratepayers' necks in respect of the electrical installation that they are no more free agents. Electric lighting you have got, and electric lighting you must continue to have." That is the position at Watford; and the ratepayers have grumbled bitterly over the lighting and the burden. The cost of lighting the streets of the town now amounts to £4175, which is a heavy charge for such a place. To those who complain, the cool reply is that too much capital has been expended for any withdrawal to be made now. But since electric lighting was first adopted for street purposes in the town, gas lighting by inverted burners has made tremendous progress, whereby, with lessened consumption of both gas and mantles, a greater illuminating power and better distribution of light are obtained. Our electrical friends need to be constantly reminded of this, as they find it very convenient to lose sight of the fact. Now that people are seeing what is being done by modern gas-burners in the public streets, they are getting more and more dissatisfied with the manner in which their local councils have tied them securely to a system of electric lighting. There is Worthing, for instance. The people of the town are very anxious to have the street arc lamps replaced by gas-lamps; but the upholders of the sanctity of municipal electric lighting are lifting their hands in pious horror at the bare idea of gas-lamps up-to-date displacing the flickering and unreliable electric lamps. Worthing happens to have learned a good deal about "When it was dark" since electric lighting has been in the streets.

We have heard a good deal about glare lately, and of the necessity for protecting the eyes of the users of metallic filament lamps either by employing special diffusing globes or lamps with frosted bulbs, which make the question of cost all the worse for electricity on the light-for-light basis. The "Electrical World" has recently published the results of some measurements of the intrinsic brightness of illuminants that Messrs. H. E. Ives and M. Luckiesh have made. The figures are worth publishing for comparison.

	Candle Power per square mm.
Carbon arc crater	130
Magnetite arc	6·2
Nernst glower (115-volt, 6-ampere)	4·7
Incandescent lamps:—	
Tungsten, 1·25 watts per candle	1·64
Graphitized carbon filament, 2·5 watts per candle	1·2
Tantalum, 2 watts per candle	0·9
Carbon, 3·1 watts per candle	0·75
Carbon, 3·5 watts per candle	0·63
Carbon, 4·0 watts per candle	0·50
Acetylene flame (1-foot burner)	0·082
Acetylene flame (¼-foot burner)	0·057
Welsbach mantle	0·048
Welsbach (mesh)	0·067
Cooper-Hewitt mercury-vapour lamp	0·023
Kerosene flame	0·014
Gas-flame (fishtail)	0·004
25-watt frosted tungsten lamp	
Tip	0·0026
Side	0·0093

If the candle power per mm. of the tungsten lamp (1·64) is compared with the Welsbach mantle (0·048 or 0·067), the cause of the complaint as to glare, eye strain, and so forth through using metallic filament lamps is readily seen.

It is a pity that men in public places commit such curious indiscretions as Alderman Hind did recently at Stockton at a prize distribution in connection with evening technical classes. He told the students that every gas-burner in a room consumes as much air as every five or six persons. He does not appear to have said what sort of gas-burner he was referring to. If he was, for example, alluding to a 1 cubic foot, a 2½ feet, or a 3 feet inverted incandescent burner, he was not telling the students that which is true. But surely Alderman Hind, who essays to address technical students on this subject, is aware that the main thing is not the consumption of air (there is plenty of that), but the relative deleteriousness of the emissions of individuals and of gas-burners. We have referred to the subject several times of late, as Alderman Hind will see if he cares to look up recent issues. He will find that modern knowledge in this regard is somewhat different from the knowledge of a past day. But it is a singular thing that all who are interested in electricity prefer the statements made in a less enlightened time than the present. The fact is that the musty old notions suit them better. But the choice speaks volumes.

MEETING OF THE SOCIÉTÉ TECHNIQUE.

Provisional Programme.

As already announced in the "JOURNAL" the annual congress of the Société Technique du Gaz en France will be held at Marseilles on Monday, the 22nd prox., and following days. The President is M. Henri Marquesan, one of the Directors of the Marseilles Gas and Electricity Company.

The morning of the first day will be occupied as usual with the transaction of the routine business, the admission of new members, the nomination of members to serve on the Committee, and the reception of the reports of the Committee and the Treasurer. The congress proper will open in the afternoon with the President's Address, after which there will be the customary presentation of the Government medals and the Society's awards for long and meritorious service by employees. The rest of the time will be devoted to the reading and discussion of papers, which will be continued on the mornings of the second and third days. A feature of recent meetings of the Society—the discussion of set subjects—is found in the present programme. The Committee ask members to express their views on the subjects of the manufacturing processes and mechanical appliances in use in gas-works of small and medium size (carbonizing from 3000 to 10,000 tons of coal per annum), and the contamination of gas in holders.

In the afternoon of the second day, visits will be paid to the works of the Gas and Electricity Company, and to the transformer station of the Company for the Supply of Electrical Energy on the Mediterranean Coast. The next afternoon the members will go by tramway to Allauch. On Thursday, the 25th, there will be an excursion by P.L.M. train to Hyères. Luncheon will be served at the Hotel du Golf, and afterwards the members will visit the gas-works, which belong to the Société Lyonnaise des Eaux et de l'Eclairage. The South of France Railway Company will place a special train at the disposal of the members to convey them to Toulon, where they will take their morning train back to Marseilles in time to allow anyone wishing to do so to leave the city that night.

The social functions connected with the congress will be a banquet given by the Marseilles Gas and Electricity Company on the evening of the opening day, and the Society's own banquet, on Tuesday evening, which will take place in the restaurant of the Casino at the Prado.

As usual, there will be an exhibition of gas appliances during the congress; some being located at the place where the meetings will be held—the Salons Massilia, in the Rue de l'Arsenal—and the others at the Company's central show-room on the Place de la Préfecture.

Road Improvements and Tar.

Mr. W. J. A. Butterfield writes to point out that the brief summary of his remarks on the discussion on the papers read by Mr. J. Walker Smith and Mr. H. P. Maybury before the Institution of Civil Engineers given in the "JOURNAL" last week, p. 169, conveys a wrong impression in regard to his views on the extent to which tar should be used in road construction and maintenance. The words in the report to which he takes exception are: "The speaker thought that tar should be husbanded, using it only for roads that were subjected to heavy traffic." He says that he intended rather to indicate that the tar-macadam method of reconstruction advocated by Mr. Walker Smith should be restricted to roads subjected to very heavy traffic, but that tar should be applied by way of surface treatment (as carried out so largely and successfully by Mr. Maybury in Kent) to all other primary, secondary, and tertiary roads in the country. The available supplies of tar would not, Mr. Butterfield estimates, suffice for the tar-macadam reconstruction of all these roads; whereas they would serve for their surface-treatment—a method which requires eventually only one-fourth to one-fifth the quantity of tar necessary for the construction and maintenance of tar or pitch macadam.

Eastern Counties Gas Managers' Association.—We learn from the Hon. Secretary (Mr. T. A. Guyatt, of Ely) that the next meeting of the Association will be held on Friday, at the Liverpool Street Station Hotel, E.C., under the presidency of Mr. J. W. Auchterlonie, of Cambridge. The programme will include two papers—one by Mr. F. Paternoster, of Felixstowe (the Vice-President), on "Reconstructing a Retort-House;" and the other by Mr. J. H. Brearley, of Longwood, on "Heating Flueless Rooms." The general business will include the election of President, Vice-President, and office-bearers for the ensuing year, and also three new members.

C.-P. AT THE C. P.

Start of the Interior High-Pressure Gas-Lighting.

SITTING in the North Nave of the Crystal Palace on Saturday evening, with about one a flood of illumination that seemed to challenge the detection of a dark spot anywhere, thoughts ran back many years, to days when the Palace stood at the topmost point of boyish imagination as the most wonderful creation on God's earth, and the centre of the most marvellous doings. At eventide the Palace was "illuminated"—grandly we thought then. A single gas-pipe ran along the top gallery of the huge structure on both sides. The pipe was pierced at regular intervals and single-jet burners were screwed into the holes, and from these the main illumination of the Palace was derived. We can picture the men now with their little flask of spirits and their hand torches setting out to light-up the Palace; we can picture now the up-turned faces of the youngsters as they watched the dark figures in the heights of the galleries just where the curve of the great roof ends, passing rapidly along with their little torches and lighting up the myriads of jets. It was, from our then youthful way of thinking, a wonderful sight to witness (from the floor-level) those innumerable little flames spring into being; and when all was finished, the illumination was considered grand. Round the side courts and in the long corridors and here and there in the main walks of the grounds—far apart in the grounds, and only serving as guides in the dark of night—were flickering flat-flames. No one dreamed of questioning the sufficiency of the lighting in the Palace; no one dreamed then of asking for more. It was all that people had been accustomed to, and what was found inside the Palace was at that day considered good.

Then there came upon the scene the regenerative gas-lamp; and here and there some examples were to be found in the Palace. The period dawned of the incandescent gas-burner. The old form of incandescent burner made its appearance, tentatively at first, in our homes, in our shops, and in our streets. The side courts and the corridors of the Palace, and the few gas-lamps in the grounds must have their lighting improved by similar means. It was done. *Tempora mutantur, et nos mutamur in illis.* Then a private steam-driven set of electricity generating plant was introduced as part of the equipment of the Palace; and the long lines of gas-jets under the roof of the naves and centre transept were known no more. The amount of illumination was improved by pale-faced arc lamps. Then the people thought that surely illumination had reached the height of perfection. But opinions and requirements change with progress. The old palace remains as it was. There is no change in the structure. The same north nave and south nave, centre transept, orchestra, roofs, side courts are all there just as they were decades ago, when the illumination was of the meagre, but then in public opinion sufficient, character that has been described. Now with the Festival of Empire Exhibition and Pageant of London approaching, the best lighting that can be given to most of the main parts is to be afforded, and courts and grounds are to be illuminated in fitness with the occasion, and with modern notions. The first part of the new lighting is what one went to see on Saturday evening. Hence the glance back that makes the contrast of the illumination of the old building and grounds the more striking.

This is the Festival of Empire; it is going to demonstrate the continued empire of the gas-supply industry in the matter of the provision of artificial light. The North Nave lighting is the first indication of what is going to be in the months succeeding the middle of May. The magnificent enterprise of the South Suburban Company, as the lighting and power worlds know, secured the unique opportunity of lighting the great exhibition which will attract the peoples of the British Empire to Sydenham. And beyond that they obtained the contract for furnishing the power that is to generate the electric current for motive purposes and for illumination where electricity is to be used for lighting and decoration, with, possibly, the comparatively small exception of the lighting that is left to the existing private steam-driven plant. But for the moment it is the North Nave in which we are interested, with its extraordinary display of what high-pressure gas lighting can effect in artificially producing the nearest approach yet made to a flood of light from Nature's greatest illuminant. It is accomplished by Keith's 3000-candle power high-pressure inverted lamps, which were brought into use for the first time on Friday evening. The light from them illuminates this section of the Palace as it has never been illuminated before. The light penetrates everywhere, and, in this part, the beautiful work of Paxton is seen at its very best. The lighting alone seems to have given a new lease of life to this portion of the Palace. The people on Saturday evening—those who remained after the abortive "Football "Final"—seemed to be naturally attracted to the north nave by the life that the new gas-lamps imparted to it. Men were sitting about reading in perfect comfort the narratives in the evening papers of the struggle that had been witnessed on the football ground between teams from Newcastle and Bradford. But how many, one wondered, gave much thought to the progress in artificial illumination that the lamps suspended 27 feet from the floor-level represented. However that may be, there was all the evidence of public attraction and satisfaction.

In all, there are 22 of these 3000-candle power Keith lamps in the nave, suspended in two rows of eleven—one row on each side, with the units spaced about 48 feet apart. Each lamp is fitted with two mantles; and no globes are used, but a deep hexagonal screen is fitted round each lamp. The gas is supplied from a compressing plant, situated in an outhouse in one corner of the North Tower Gardens. It consists of a "D" size Keith compressor, direct coupled to a small "National" gas-engine. But the ultimate purpose of this compact little plant is only to feed the interior lights when the large plant (in duplicate) is not working that is being installed in a building near the Penge entrance of the grounds—for example, during the hour or so that it will be necessary to illuminate the Palace before the lighting of the grounds is required. The plant near the Penge entrance will consist of "F" size compressors in duplicate. Temporarily therefore the high-pressure lamps in the north nave are relying solely upon the small single plant in the North Tower Gardens. In addition to the 22 3000-candle power lamps in the nave proper, the side courts are illuminated by high pressure lamps of various illuminating powers from 1000 down to 300 candles. The whole of the lamps are worked by Keith automatic lighters and bye-passes, by means of which as the pressure increases (the pressure at which the gas is supplied is 80 inches) the gas-way is opened, and the lamps are lighted up.

From the midst of the effulgence in the north nave, one glances across the centre transept to the south nave, in which a dozen or so electric flame arc lamps have been fixed. On Saturday evening these were supplemented by the light of their predecessors—the ghastly looking arcs. But the combined efforts of the lamps resulted in an illumination that was dead in comparison with the brightness and attractiveness that reigned in the north nave. It was said by an electrical paper a short time since that this interior Palace display would afford an excellent means, under precisely similar conditions and surroundings, of judging the relative effects of the two latest forms of high-power lighting—gas and electric. It does. And we are highly satisfied with the contrast, and with the verdict of the public, and of the stallholders. But in order that there should be no false impression by judgment from a distance, a visit was paid to the south nave; and the illumination—there was no doubt about it—was dull in comparison with that of the north nave. From far down the south nave, one looked towards the north nave; and the sparkling lights and brilliance there were too inviting to allow of any prolonged stay from where the view was taken. We should not be surprised if those who have booked space in the south nave for the exhibition will not feel highly envious of those who have secured space in the north nave. It is known by frequenters of the Palace that there are already whisperings to that effect.

However, what is seen inside the Palace in the way of high-pressure gas lighting is small in comparison with what will be witnessed in the grounds, which have been transformed by a nearly completed new White City. Standing on the Upper Terrace, and looking over the undulating and wooded acres—the pride of Sydenham and the neighbourhood—the sumptuousness of what will be, and that soon, is vividly attested. There are the palatial buildings of our colonies and dependencies—Canada, India, Australia, New Zealand, and South Africa—all are represented. There are the numerous other buildings of individual ornate design and varied size, down to the kiosks. There are the artificial rocks and hills, the Indian village, and the side shows making provision for amusement of various kinds; and already the laughter of the football enthusiasts is heard from the spinning joy-wheels. There is the extensive pageant ground with its lake, its state boats, its old-time scenery, and its surrounding woods and glades. There is the light railway running its sinuous course about the grounds, and presently to be supplied by electric energy from town-gas driven generating plant. There is the power house itself, the structure of which is not quite finished, but is well advanced. The South Suburban Gas Company have pushed forward with it vigorously; but the Chief Engineer (Mr. S. Y. Shoubridge), and the Distributing Superintendent (Mr. H. Baldry), with the assistance of an indulgent Board, on which are such progressive gas engineers as Mr. Charles Hunt (Chairman), Mr. Robert Morton, and Mr. Charles Carpenter, cannot exert their energies beyond the limitations set by time and hard-pressed contractors. But day by day now will see good developments. Already the 750-horse power "National" gas-engine has its heavy parts fully-erected. The foundations for the two 1000-horse power "National" engines are ready for their erection. Their heavy parts are arriving. Among them a 12-ton fly-wheel was seen on Saturday. The electrical plant will soon be to hand. These gas-engines will, we believe, be the largest in the country driven by town gas. Anyway, they will be the largest that are employed with town gas in generating electrical energy. For engineers—and particularly gas and electrical engineers—this power house will be the centre of much interest.

All the gas-mains required for high-pressure and low-pressure gas distribution for lighting and power have been laid; the erection of the high-pressure lamp columns has been nearly completed, and so has the large compressing plant near the Penge entrance. As previously remarked, what is now to be seen in the north nave in the way of high-pressure gas lighting is small compared with what will be witnessed in the grounds. Along the broad terraces, the lamps that are being erected will in the main be of 4500-candle power; and along these, and in the centre walk and round the large band-stand that has been erected in what was at one time known to old Crystal Palace habitués as the centre basin, visitors will promenade with a wealth of soft light about them, from sources that will not weary the eyes through a high intrinsic brilliancy or through ceaseless flutterings. In the other walks extending beyond and from the sides of the arterial avenues high-pressure lamps of other denominations in the matter of power

are being erected. Down the tree-bounded centre walk beyond the main exhibition buildings to the Penge entrance, centrally placed standards, bearing high-power lamps, will scatter their light far and wide. There will be no danger spots through want of light in all the principal walks, however dark the night. Remember, too, that if gas is not so convenient as electricity for outlining the exteriors of extensive buildings, gas can generate the current at a cheap rate for the purpose; and it is going to do it here. Let it be known far and wide that all the illumination and power that will be seen and used in the exhibition proper has its source in the commodity drawn from the Gas Company's mains.

The Festival of Empire is going to present, from a few weeks hence, an unrivalled night picture in which light will play a part under unprecedented conditions. There will be plenty of "Candle Power" at the Crystal Palace. The north nave night by night now makes us look with pleasurable anticipation to the consummation of the development that is proceeding every workable hour at Sydenham.

METRIC SYSTEM OF WEIGHTS AND MEASURES.

Tables of Equivalents.

We have received from Mr. E. B. Rosa, the Acting Director of the Bureau of Standards of the United States Department of Commerce and Labour, a pamphlet descriptive of the metric system, accompanied by tables of equivalents, and a large coloured chart showing graphically the differences between the various measures.

The pamphlet contains a short history of the system, the essential features of which were embodied in a report made to the French National Assembly by the Academy of Sciences as long ago as 1791; but it is only during the past twenty-five years that active steps have been taken to bring about its universal adoption. The advantages claimed for it are: (1) The decimal relation between the units; (2) the simple relation of the units of length, area, volume, and weight to each other; and (3) the uniform and self-defining names of the units. After the short introduction, a synopsis is given of the system, with diagrams and tables facilitating its comparison with the existing measures employed in the United States. The tables of equivalents represent an enormous amount of labour. They run from 1 to 1000 units of length, area, volume, capacity, mass, and power. The table showing the equivalent in miles of 1 to 1000 kilometres is a very useful one, and that in which cubic metres are converted into cubic yards can be made serviceable to people interested in Continental gas undertakings by multiplying the figures by 27, to bring them into cubic feet. Another useful table contains a comparison of the various tons and pounds used in the United States with the French kilogramme and the English avoirdupois and troy pounds. A chapter sets forth the status of the international metric system in the United States; and there is an index.

With regard to the chart, the coloured diagrams appeal at once to the eye, and show how the metric measurements compare with the old ones better than could be done by figures or explanatory matter. For example, the measures of length are placed one above the other; and it is at once seen how nearly 25 millimetres equal an inch, 100 millimetres (or 10 centimetres) 4 inches, and 1000 millimetres (or 100 centimetres) 40 inches; while 3 decimetres are shown to equal roughly 1 foot. The measures of capacity are also easily comparable. The litre (1¾ pints) is seen to be equal to a kilogramme (1000 grammes) of water; and a cubic centimetre, about which so much is heard in connection with the bacteriology of water supply, to 1 gramme, or 15 drops.

The preparation of the pamphlet, tables, and chart must have entailed considerable expense. They are not on sale; but they were courteously supplied in response to a request for copies, for which we take this opportunity of expressing our thanks.

The Midland Junior Gas Engineering Association will hold their sixth annual general meeting at the Birmingham Municipal Technical School next Thursday evening. The report and balance-sheet will be submitted, officers and members of Council elected, and an alteration of the rules considered. After this, Dr. W. B. Davidson and Mr. G. C. Pearson will contribute a paper on the "Birmingham Coal Test Plant."

Blast-Furnace Gas as a Motive Power in Germany.—Writing recently in the Engineering Supplement to "The Times," on the subject of "Waste Gases in German Iron-Works," Herr Rudolf Pokarny, of Düsseldorf, said: "The appreciation of the immense advantages which could be secured by the economic utilization of the heating effect of the residual gases from blast-furnaces has had in Germany a stimulating effect upon the construction of large gas-engines. Although the employment of blast-furnace gas for such engines has been successfully adopted since the year 1900 only, it has, in spite of certain initial failures, spread very rapidly. At the present time there are some 300 engines working on blast-furnace gas, with an effective yield of about 650,000 H.P. These are distributed over some 41 separate iron and steel works throughout Germany; and in several of these undertakings in Rhenish-Westphalia and in the Lorraine districts, gas-engine plants, with an effective output of 50,000 H.P. and upwards, are in steady operation with extremely satisfactory results."

CONCILIATION (TRADE DISPUTES) ACT.

Under an Act passed in 1896, and entitled the Conciliation Act, provision was made for the registration of such Conciliation Boards as are constituted for the purpose of settling disputes between employers and workmen, and for the furnishing by them to the Board of Trade of such returns, reports of proceedings, or other documents, as may be required. The Board are also empowered, where a difference exists or is apprehended between employers and employed, to take steps with a view to an amicable settlement of the difference; and these steps may include, among other things, the appointment (on the application of either party) of a person or persons to act as Conciliator or as a Board of Conciliation, or (on the application of both parties) the nomination of an Arbitrator. The eighth report by the Board of Trade, which covers the proceedings under the Act during 1910, and bears the signature of Mr. G. R. Askwith, of the Labour Department, was issued a few days ago; and it constitutes a gratifying record of progress in the direction of rational settlement of labour disputes. In fact, the number of cases during the year in which action was taken by the Board of Trade under the Act was 67; and this is a record. Of these, 26 were disputes involving stoppage of work affecting in the aggregate about 190,000 employees.

Since 1896, 432 cases in all have been dealt with; and of these no less than 223, or rather more than one-half, occurred during the last four years. Of the 432 cases, there were joint applications in 278; this figure including a number of instances in which application for the appointment of an arbitrator or conciliator was made by the parties as the result of negotiations conducted by officers of the Labour Department. In 95 cases the application was made by the workpeople only, and in 26 by the employers only. In the remaining 33 instances, the Board of Trade took action on their own initiative, and no application was made by the parties. In the earlier years, it may be noted, applications for the intervention of the Board of Trade came mainly from one side only (and that generally the workpeople); but recently the majority of applications have been made jointly by the parties or by organizations representing them. During 1910, the number of joint applications was 44, or two-thirds of the total cases dealt with; while in thirteen instances applications were received from the workpeople only, and in two from the employers only. It need hardly be pointed out, in noticing this report, that nowadays much good work is accomplished by methods of "conciliation" without any intervention on the part of the Labour Department. As a matter of fact, the total number of Conciliation Boards in existence at the end of 1910, so far as was known to the Department, was 282. This number is made up of 265 boards dealing with particular trades, and 17 district and general boards, including those registered under the Conciliation Act as well as those not so registered. The rules of a number of these Conciliation Boards and other agreements arranged by employers and workpeople in the various trades, frequently contain a clause providing that, in the event of failure to effect settlement of a dispute locally, application shall be made to the Board of Trade for the appointment of an umpire, arbitrator, or conciliator. Such clauses, so far as is known to the Department, now exist in 96 agreements.

Among the most important of the disputes in which action was taken by the Board of Trade during 1910 were those affecting coal miners in Northumberland and South Wales. The dispute in the coal mining industry in Northumberland, it is stated in the report, arose out of the dissatisfaction of the workpeople with the arrangements proposed by the coalowners in connection with the working under the Coal Mines Regulation Act, 1908, which came into operation in that field on Jan. 1, 1910. A formal agreement had been entered into between the Owners' Association and the Miners' Association; but the employees took exception to the arrangements made by the owners to carry out this agreement, and struck work. Altogether about 30,000 miners were affected by the stoppage; and, though settlements were effected at individual collieries, over 11,000 were still on strike at the end of January last year. In February, the Executive of the Miners' Association declared the strike terminated, and called on the men to resume work. They refused, however, to do so; and a deadlock having been reached, the Board of Trade invited representatives of the Executive and of the men on strike to a conference. As the result of meetings under the chairmanship of Mr. Askwith, a committee of the men's representatives, accompanied by Mr. Mitchell, of the Board of Trade, visited the collieries where the strike was still in progress, and reported what had taken place at the conferences. Later there was a ballot of the men, when a majority were in favour of a resumption of work. There were in 1910 two important disputes in the coal-mining industry in South Wales in which the Board of Trade took action. On Jan. 1, the Secretary of the workmen's side of the Board of Conciliation for the Coal Trade of Monmouthshire and South Wales gave formal notice to terminate, on March 31, an agreement for the regulation of wages which had been arrived at in 1905. A clause in the agreement provided that, on the expiration of the notice to terminate the agreement, all contracts of service between the respective owners and their workmen should cease; and accordingly negotiations were entered into for a new agreement. Several meetings of the Conciliation Board were held without result; and then, in view of the seriousness of the position, the Board of Trade approached the parties,

Separate meetings of representatives of the Coalowners' Association and of the South Wales Miners' Federation were held, under the auspices of the President, at the Board of Trade offices; and as the result a further meeting of the Conciliation Board was arranged, when the owners' representatives made certain modified proposals which, after consideration by the workmen's representatives and later by a meeting of the Miners' Federation of Great Britain, were submitted to a ballot of the men and accepted. Then, as will be well remembered, later in the year a series of disputes broke out in the same coalfield—the most important being that involving about 13,000 miners in the Rhondda Valley in the employ of the "Cambrian Combine." Serious disturbances necessitated the calling in of the police and military. In November, the Board of Trade invited the parties to discuss the matter; and Mr. Askwith presided over joint conferences. In this instance, unhappily, the efforts of the Board of Trade did not meet with that success which they deserved; and the men are still idle.

During the year recourse was had in eight cases to the system of Courts of Arbitration established in 1908. In each instance the court was composed of three members—a Chairman selected from the Chairmen's Panel and two Arbitrators selected in five of the cases respectively from the Employers' Panel and the Labour Panel drawn up by the Board of Trade. In the remaining three cases the Arbitrators were selected from outside the panels by the parties themselves. Three important disputes involving a stoppage of work were settled in this manner. The other disputes dealt with by means of a Court of Arbitration did not involve a stoppage of work.

Of the 67 cases dealt with by the Board of Trade in 1910, fourteen arose in the building trades, seven in the mining and quarrying industries, thirteen in the metal, engineering, and shipbuilding trades, ten in the boot and shoe trade, seven in textile trades, three in transport trades, and thirteen in other trades.

LOCAL INCOME AND EXPENDITURE.

Finances of Urban District Councils.

SOME figures were given in last Tuesday's issue of the "JOURNAL" (p. 167) with regard to the finances of borough councils for the twelve months ending March 31, 1909; and these may now be supplemented by similar statistics relating to the financial transactions of urban district councils, other than town councils, for the same period. These particulars are to be found in Part VI. of the Annual Local Taxation Returns.

The number of urban district councils in England and Wales, other than town councils dealt with in the report is 815. This shows an increase of two when compared with the previous year; there having been three new councils formed, while one has disappeared in consequence of having been incorporated. As is the case with the larger bodies whose affairs were noticed last week, the accounts of the urban district councils are concerned to a considerable extent with "reproductive" undertakings such as gas, water, electric lighting, markets, and tramways and light railways. Bearing on the question of "reproductiveness," it is set forth in the returns that the total receipts from these undertakings were sufficient to cover 94·9 per cent. of the expenditure on the concerns, including charges in respect of loans. Another large portion of the transactions relates to works of private improvement, the cost of which is recovered by the councils from owners or occupiers of property; and the financial statements also include receipts from sewage farms, baths and wash-houses, slaughter-houses, hospitals, cemeteries, &c. Of the total number, 54 councils acted as local elementary education authorities.

The receipts of the urban district councils, excluding receipts from loans, amounted during the year 1908-9 to £11,525,958, including £1,677,387 on account of elementary education. The total receipts of the councils for the preceding year were £11,085,679. It should be pointed out that these receipts included sums received from county councils under the provisions of the Local Government Act, 1888, and also grants under the Agricultural Rates Act, 1896. The latter Act, however, does not apply to general district rates, which, in the case of the urban district councils, produced 84·9 per cent. (£5,326,832) of the total raised by rates (£6,270,720); and hence the amount of the grants is small in comparison with that of the total receipts. Among the other receipts were: Gas-works, £1,006,446 (compared with £971,241 in the preceding year); water-works, £707,376 (against £693,310); electric lighting undertakings, £359,718 (against £331,097); and tramways and light railways, £231,623 (against £240,298). With regard to these figures, and others which may be used for purposes of comparison, it is remarked in the Blue-Book, changes made in the urban districts—which are subject to continual alteration—should be taken into account. From time to time new districts are formed and existing ones are either incorporated or added to boroughs. So far as could be ascertained from the financial statements for the year now referred to, the receipts in respect of gas-works, just quoted, included £744,775 from gas-rentals, and £224,791 from the sale of residual products. The receipts in respect of water-works included £482,941 from water rates, rents, or charges for domestic purposes within the respective districts of the councils owning the water-works. The amount raised during the year 1908-9 by means of public rates accounted for 54·4 per cent. of the total receipts; while the receipts from the principal undertakings which produce revenue (gas, water, electric lighting, markets, and tramways and light railways), together with those in respect of private improvement works, represent rather less than 24·4 per cent. of the income of the councils.

The total expenditure of the urban district councils for the twelve months ending March 31, 1909, excluding that defrayed out of loans, was £11,437,768, as compared with £11,064,969 for the preceding year; so that there was an increase on this side of the accounts of £373,000. About £88,000 more appears under the head of education; and loan charges are some £56,000 heavier. The following items of expenditure (in which charges for interest and for repayment of loans are included) may be compared with the year 1907-8: Public roads and streets, £2,058,199 (against £1,972,741); education, £1,767,060 (against £1,678,955); gas-works, £969,317 (against £918,102); public lighting, £511,079 (against £506,460); sewerage and sewage disposal, £1,207,629 (against £1,176,087); water-works, £785,385 (against £783,106); tramways and light railways, £295,694 (against £293,305); electric lighting, not being public lighting, £375,535 (against £346,331). The loan charges—repayment of principal (otherwise than out of sinking funds or redemption funds), payments to sinking, &c., funds, and interest on loans—amounted to £2,999,863, compared with £2,943,601 in the preceding year. Of the principal and interest so paid, and allocations to sinking funds, £255,124 was on account of gas-works, £385,342 of water-works, £191,976 of electric lighting, and £134,354 of tramways and light railways. The aggregate length of main roads maintained and repaired by the councils at the commencement of the year 1908-9 was 2391 miles; and the expenditure under this head amounted during the twelve months to £473,619, or at the rate of just over £198 per mile. The total length of roads other than main roads maintained and repaired was 11,692 miles; the expenditure being £919,164, or an average of about £78 10s. per mile.

The expenditure of the urban district councils out of loans (including certain sums spent in anticipation of loans) during the year under review amounted to £2,203,447. Of this, £111,171 was on gas-works, £268,360 on water-works, £163,617 on electric lighting, £77,367 on tramways and light railways, and £432,683 on sewerage and sewage disposal works. The total expenditure out of loans during the year was less than that of 1907-8 by £62,491. Large decreases appear in the expenditure on account of tramways and light railways; and sewerage and sewage disposal works and gas-works also show a falling off. The expenditure on water-works and electric lighting, on the other hand, exhibits an increase. The total amount of the loans raised during the year was £2,340,923, including the following sums: Gas-works, £148,154; water-works, £275,433; electric lighting, £210,100; tramways and light railways, £88,527; and sewerage and sewage disposal works, £404,782. The amount of loans raised exceeded that of the previous year by £137,263. There are large increases for water-works and electric lighting; but some other items show a decrease.

The amount actually repaid during the year in respect of loans (including payments out of sinking or redemption funds, but excluding unexpended balances of loans applied to the repayment of principal) was £1,691,795. The outstanding loans at March 31, 1909, amounted to £36,598,419. Of this debt, £8,557,934, or 23·4 per cent., was for purposes of sewerage and sewage disposal; £5,518,586, or 15·1 per cent., for water-works; £3,943,734, or 10·8 per cent., for education; £3,509,329, or 9·6 per cent., for gas-works; £3,222,127, or 8·8 per cent., for street improvements; £2,454,634, or 6·7 per cent., for electric lighting; and £2,128,844, or 5·8 per cent., for tramways and light railways. The loans outstanding in respect of what are termed "reproductive" undertakings, and for works of private improvement, represent a large proportion of the debt; the aggregate for water-works, gas-works, electric lighting, tramways and light railways, markets, and works of private improvement being no less than £14,655,074, or 40 per cent. of the total debt. Loans outstanding increased during the year 1908-9 by £650,312. Under several headings the amount outstanding at March 31, 1909, was slightly less than it was a year before. The amount remaining at the end of the twelve months in sinking and redemption funds for meeting loans repayable in this way, was £628,158. The sum paid into the funds during the year was £230,561; and the amount taken out of them and applied to the repayment of principal was £181,465.

According to the census of 1901, and taking into account the alterations of area made since that time, the total population of the 815 urban districts other than boroughs was at March 31, 1909, 6,815,302. The total assessable value of the districts for the purposes of the general district rates, or other rates out of which the general expenses of the councils were defrayed, was £33,894,915. The rates raised by the councils, other than for purposes of elementary education, amounted to £5,487,055, which was equivalent to 3s. 2·85d. in the pound on the total assessable value of the districts for the purposes of such rates. This figure compares with 3s. 2·66d. in 1907-8. The total sum raised by the councils by means of rates during the year for purposes of elementary education was £783,665, representing a rate of 1s. 4·79d. in the pound calculated upon the assessable value for the purposes of the poor rate of the districts in which the amount was raised.

The comparative tables which, as usual, accompany the returns show that the receipts of urban district councils, acting as urban sanitary authorities, burial boards, harbour, pier, or dock,

&c., authorities, and port sanitary authorities, from all sources (except elementary education), other than from loans, increased from £9,087.267 in 1904-5 to £9,848,571 in 1908-9; and the total expenditure not defrayed out of loans (for purposes other than elementary education) increased from £8,969,257 in 1904-5 to £9,776,395 in 1908-9. The receipts from public rates for purposes other than elementary education (including grants under the Agricultural Rates Act, 1896), which in 1904-5 amounted to £5,152,791, rose in 1908-9 to £5,490,867. Receipts from the most important undertakings which yield revenue—water-works, gas-works, electric lighting, tramways and light railways, and markets—have shown large increases, it is pointed out, during the last four years; while the annual expenditure in connection with these undertakings has also increased considerably. The expenditure out of loans fell during the five years 1904-5 to 1908-9 from £3,938,592 to £2,203,447—a decrease of 44·3 per cent. It is once more remarked in the Blue-Book that in recent years there has been a distinct slackening in the rate of increase of the debt of the urban district councils. The outstanding loans of the councils at the end of the year 1899-1900 amounted to £21,013,554; while at the end of the year 1903-4, they were £32,415,809; and at the end of the year 1908-9, £36,598,419. Thus the total debt of the urban district councils rose in the five years ended March 31, 1905, by £12,638,047, or 60·1 per cent.; whereas in the five years ended on March 31, 1909, it rose by only £4,182,610, or 12·9 per cent. In 1904-5 the outstanding loans for electric lighting undertakings amounted to £2,088,441; and in 1908-9, to £2,454,634. The outstanding loans on gas-works, however, in the same period merely increased from £3,478,011 to £3,509,329; and those on water-works, from £5,386,862 to £5,518,586.

KEADY NEW GAS-WORKS.

We have received from Messrs. Firth Blakeley, Sons, and Co., Limited, of Thornhill, Dewsbury, the following description and photograph of the new gas-works recently erected by them for the Keady (Ireland) Urban District Council.

The works have been designed for manufacturing 2 million cubic feet of gas per annum; but, at the same time, they are arranged so that extensions can be readily and economically made as required in the future. The retort-house is 30 feet long by 25 ft. 6 in. wide, inside dimensions, and 18 ft. 6 in. high to the eaves; the wall being built of stock bricks, 14 inches thick, with concrete sills and gable coping. The roof is of steel, having three principals with angle purlins, and is covered with slates, and has a ventilator at the apex running the whole length of the roof. The retort-bench is formed of two arches with two and three retorts set therein respectively, on the direct-fired principle; and it is provided with a short chimney built on the bench and carried through the roof. The retorts are D shaped, 21 in. by 15 in. by 9 ft. long. The ascension, arch, and dip-pipes are all 5 inches diameter; and the hydraulic main is of steel, 18 inches wide by 18 inches deep, in one length. A 6-inch weir-valve is provided on the outlet of the foul main, together with an arrangement for drawing off the tar, and leaving a liquor seal for the dip-pipes. The retort-bench is strongly braced with joist buckstaves, tie-rods and cross joists.

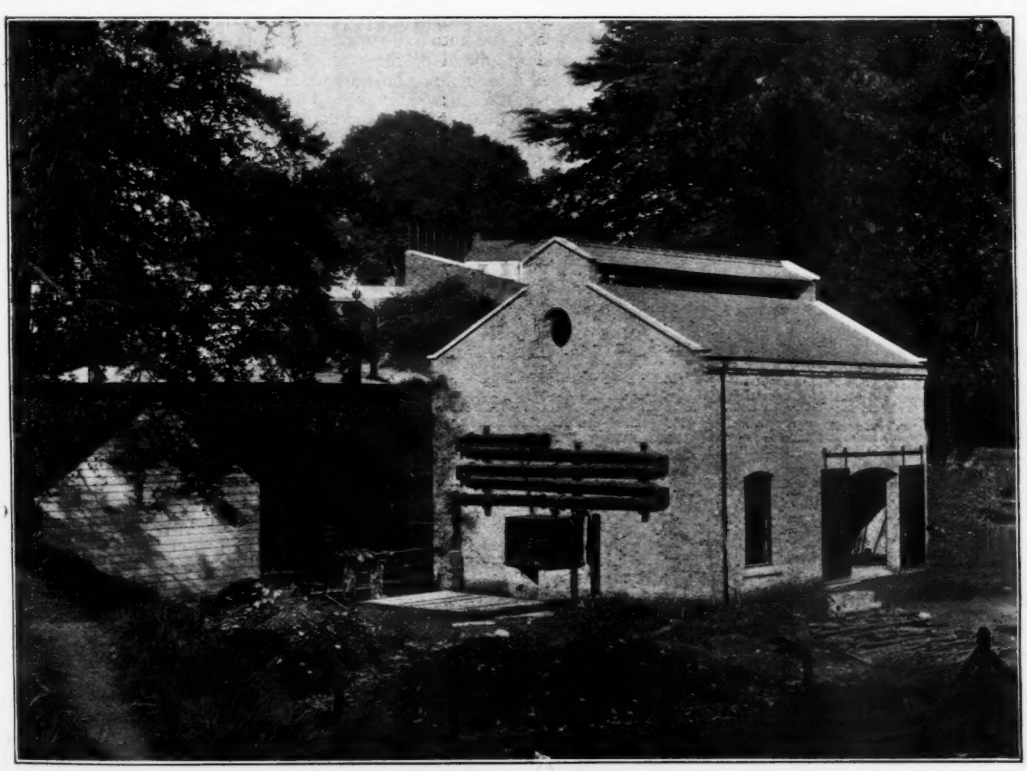
The condenser is of the horizontal type, and formed of 6 inches diameter socket and spigot pipes, fixed on brackets at the end of the retort-house; the tar draining from the condensers into a tar and liquor tank. This tank is fixed several feet above the ground-level, in order to fill the tar-barrels without unnecessary pumping, and is provided with a division seal to enable the liquor to be separated. The overflow is carried to an underground tar-well, built of brick faced with cement, and covered with 3-inch planks. A suitable hand-pump is provided for emptying the tar and liquor well when required. The tower-scrubber is of Blakeley's patent column type, 2 ft. 6 in. diameter, having twelve washing chambers, and is provided with automatic tippler and tank at the top, and also with a bye-pass arrangement. This column washer acts both as a washer and a scrubber, and has proved very effective.

There are two purifiers, each 5 feet square by 4 feet deep, of the luteless type, with four-way valves and connections, and fitted with three tiers of wood grids to each. The purifier covers are raised by means of a travelling pulley-block running on an overhead joist, carried on suitable columns. The purifiers and lime-store are all under one roof. The gasholder is 40 feet diameter, of a capacity of about 14,000 cubic feet, and is provided with a steel tank with joist columns, lattice girders, and 5-inch diameter inlet and outlet pipes. The joist standards are fixed inside the tank, thus forming guide-rails for the gasholder, and being out of sight give a good appearance to the holder. The standards are tied together at the top with lattice girders.

In a building adjoining the retort-house, a 5-inch diameter station-meter and governor are fixed; each being fitted with a suitable bye-pass arrangement. Adjoining these buildings, there is provided a manager's office and store-room—all being of brick, with slated roofs. The leading main from the station-governor to the town is 5 inches diameter, and is carried about 150 yards before it is divided into two 4-inch mains where it reaches the chief street. A 4-inch main is carried to each end of the town; and 3-inch mains have been laid branching from it.

The site of the gas-works has been admirably chosen—at the lowest portion of the town, and near the railway station. The banking of the railway adjoins the ground of the gas-works; and at a future date it may be possible to put in shoots by means of which coal could be discharged direct from the railway trucks on to the ground. The work was completed last August; and gas making was commenced at once, and has continued without intermission since. The station-meter has registered over 1½ million cubic feet since the works were started; and there is every prospect of the concern proving a financial success.

The whole of the contract, including the building work, foundations, gas plant, and main-laying, was carried out by Messrs. Firth Blakeley, Sons, and Co., under Mr. James Whimster, J.P., of the Armagh Gas-Works, who was the Engineer. Mr. Whimster was assisted in the details by his son, Mr. J. W. Whimster, Assistant-Engineer to the South Suburban Gas Company. The whole of the plant was new; and the total cost was under £2000.



Photograph of the New Gas-Works at Keady.

COKE TELPHER PLANT AT THE BOVISA GAS-WORKS, MILAN.

Fig. 1.—General View of the Coke Telpher Plant at the Bovisa Works.

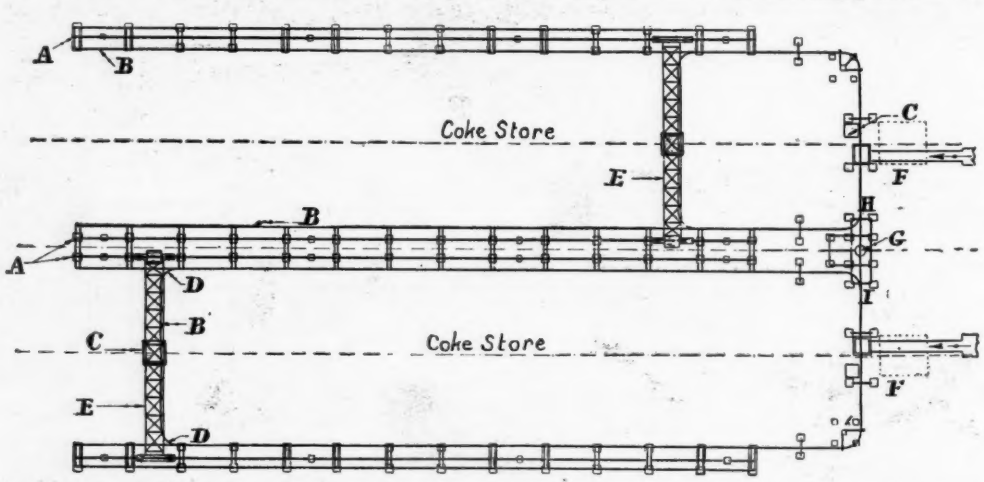
In a recent number of our Italian contemporary, "Il Gaz," appears an illustrated description of the telpher plant installed at the new gas-works at Bovisa, Milan, for conveying coke from the retort-houses and for depositing it in the storage yard. The coke from the retorts is received by two conveyors which continuously supply hoppers placed outside the retort-house, from which hoppers the telpher plant takes the coke and conveys it to the point in the yard where it is desired to store it.

A general view of the whole plant is given in fig. 1. The principal objects aimed at were: Simple and safe working, automatic emptying of the skips in the coke yard, and entire absence of shocks and damage to the coke in transit. The greatest height of the coke stored in the yard is 6 metres (or about 20 feet), and the area covered is 50 m. by 85 m. (164 feet by 262 feet); so that there is a storage capacity of about 11,000 tons.

The plant, as will be seen from fig. 2, consists of two overhead lines in the shape of a U, independent of one another in normal working, but able to be connected together in exceptional circumstances by a short line of communication. At the bottom of the U (that is, at the shortest of the three sides of each line) is the end of one of the conveyors, which discharges into a hopper provided with a movable door. The two U-shaped overhead lines are almost identical one with the other, with their longer sides running longitudinally with the storage site, and their shorter sides connecting to them by a curved line, all lying in a horizontal plane at 9·50 metres (or about 31 feet) above the level of the ground. Upon these overhead lines are placed special double-headed steel rails; the whole being supported by iron trestles every 6 metres (20 feet) strongly fastened into concrete beds. These trestles carry on heavy double T-iron girders the rails for the travelling platforms, which are formed of curved beams and have a clear span of 23 metres (75 ft. 6 in.), and rest on carriages with three wheels. The two carriages are connected together with transmission gear, controlled from the travelling box, and can move along the length of the store. A double-headed rail on the travelling platforms allows the trucks or skips to be constantly passed from one arm of the overhead line to the other. Parallel to the rails runs a triphase electric cable of 165 volts with T-iron conductors and porcelain insulators.

The skips are shown in figs. 3 and 4, and are two in number for each line. They consist of a small carriage and a waggon. The carriage is formed of a frame and grooved wheels in steel which have ball-bearings to reduce the friction to a minimum. To the framework is fixed an electric motor of 1½ H.P. giving a speed to the carriage of 1·10 metres (3 ft. 7½ in.) per second. An electro-magnetic brake comes into operation only when the current to the travelling motor is cut off. Another motor of 3½ H.P. is used for the raising of the skips. An endless screw winch, worked directly from the motor, lifts the loaded skip at the rate of 330 millimetres (or nearly 13 inches) per second. An electro-magnetic brake ensures the stability of the load when it is not required to be lowered. The carriage is further provided with trolleys to act in case of lack of care on the part of those entrusted to work the plant.

The working of a skip is as follows: When a skip arrives on the overhead line, opposite a shoot of the outcoming coke, the truck is in its highest position. On its arrival, the electric current of the travelling motor is automatically cut-off; and from this moment the automatic working is stopped, and the skip is completely at the control of the operator. Special independent conductors allow the skip to be worked, and the waggon raised or lowered, free from the automatic control which is used for the different movements in discharging the load. The operator lowers the waggon to the level of a shoot, and when loaded it is lifted, and, as soon as the controlling lever is moved, the automatic working begins. The waggon moves towards the coke yard running on the overhead rails, and passes on to the travelling platform. On arriving at



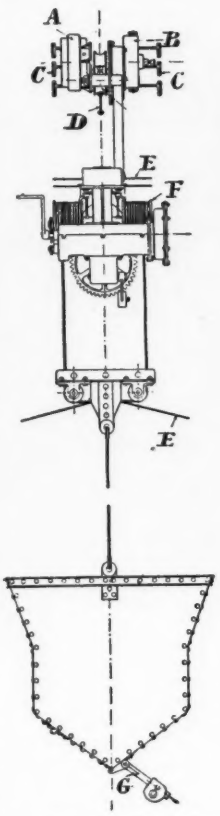
A. Overhead Travelling Rail. B. Hanging Rail for Skips. C. Box for Working Skips. D. Moveable Points.
E. Travelling Platform. F. Outgoing Coke from Retorts. G. Turntable. H, I. Standing for Skips.

Fig. 2.—Plan of the Telpher Plant.

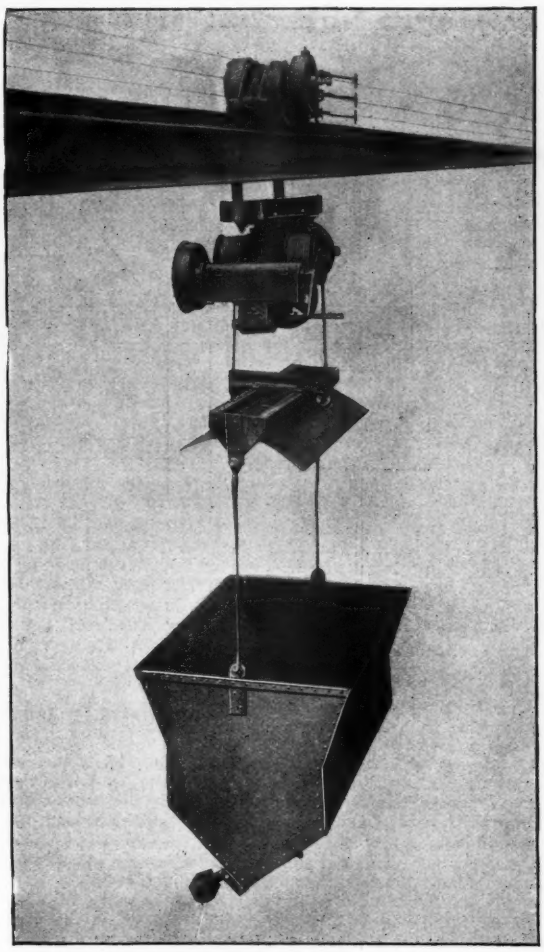
the place where the coke has to be discharged, the current is interrupted, the automatic break acts, the waggon stops, and, on reversing the current, it falls to the ground or to the level of the coke previously placed, its bottom opens, and its load is quietly disposited without the least shock. Again reversing the current, the waggon rises to the carriage; and, on reaching it, the current of the lifting motor is cut off, and the waggon commences its journey towards the coke-charging hopper. While this waggon has been making its journey, the other has been filled with coke and is ready to start.

Two men are enough for working the two platforms and their overhead lines, as they work alternately; the drawing of the two benches of retorts taking place at alternate hours as is customary. With this plant, therefore, six men for each two benches of retorts are saved; and, seeing that there are three squads per 24 hours, there is a reduction of 18 men in the 24 hours, as well as a saving of two horses. In all, therefore, there is an economy of about 75 lire (say, £3) per day in the storing of, approximately, 120 tons of coke in 24 hours.

The plant cost about 150,000 lire (say £6000); and the consumption of electrical energy is 6 H.P., due to the fact that only one or other of the two lines is at work at one time. The expense of working can thus be calculated. Including sinking fund, interest, &c., it amounts to 1 lire (about 10d.) per ton of coke stored; while without this plant, the same work cost about 1·80 lire (say, 1s. 5d.) per ton, taking into account the cost of upkeep of the narrow-gauge railway, Decauville waggons, &c. But it is not only a question of the saving in working expenses that has to be kept in view, but also the fact of not less importance that, with this plant, the coke is carried and put into store without the least breakage. The coke is preserved in large pieces, and is sold at a higher price than coke in small pieces. In conclusion, then, there is economy in working, a better size of coke for sale, less difficulty with labour by reason of fewer men being employed, and less difficulty in case of strikes.



A. Travelling Electric Motor.
B. Electric Brake.
C. Trolleys.
D. Hanging Rail.
E. Guard.
F. Lifting Drum.
G. Automatic Emptying Lever.



Figs. 3 and 4.—The Skip and Its Accessories.

It only remains to add that the plant described was made and erected by the firm of Ceretti and Tanfani, of Bovisa, Milan, who are represented in England by Mr. T. L. Cunningham, of Balfour House, Finsbury Pavement, E.C.

THE ARRANGEMENT OF TAR-TOWERS.

By G. M. Gill.

The adoption of the tar-tower in all up-to-date retort-houses, for the removal of the tar when formed and for the maintenance of liquor seals, has now become so stereotyped a method of overcoming what was formerly one of the greatest troubles of the retort-house, that it would seem unnecessary to refer to this simple but effective arrangement. Variations in the detail work of the apparatus may, however, be introduced to simplify or improve its functions without impairing its efficiency; and it is in connection with one or two of these details that this article is written.

Rules for Successful Working.

To ensure the successful working of the tar-tower, there are a few essential principles, well known to all those who have adopted the arrangement, which must be regularly maintained. But these are so simple in character that nothing short of absolute neglect can upset the proper working of the system. These principles may be summed up in the following rules:—

1.—The hydraulic mains must be kept entirely free from tar.
2.—The pipe J (p. 226) connecting the hydraulic and the column must be kept quite free from stoppage, and in a condition to allow the liquor from the tower and the tar from the hydraulic main to flow freely in opposite directions.
3.—The tower must be emptied of tar at regular intervals, and sufficiently often to prevent the tar reaching the pipe J connecting the hydraulic main to the tower.
4.—The flow of liquor into the tower must be regulated so as to ensure the maintenance of a constant seal.

Installation Details.

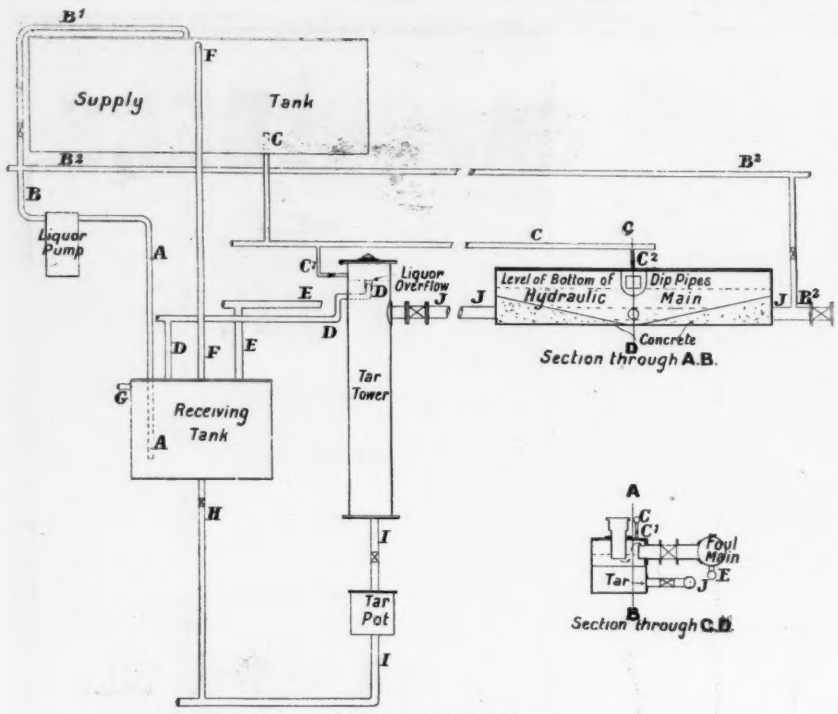
With regard to details, the writer has found it an advantage to instal a pump and an upper and lower storage tank for liquor, as shown in the drawing. The lower or receiving tank is situated sufficiently low to allow the entire quantity of liquor and tar that condenses in the foul main, and that from the overflow of each tower, to flow freely through the pipes E and D respectively into the top of the tank. The small quantity of tar which collects in the tank is run into the tar-well through the pipe H, while the liquor is pumped into the upper or supply tank. This upper tank supplies the towers by means of the pipe C_1, and is also connected to each hydraulic main by the pipe C_2 should it be necessary at any time to run liquor into the box. Both tanks are fitted with air-tight covers to prevent any escape of ammonia.

Advantages of the Arrangement.

Working with two tanks in this manner, it is possible to circulate the liquor sufficiently often to raise the strength to about 10 oz. before running it into the storage well. The pump has another most important duty, and that is to flush-out the pipe J from the hydraulic mains at least twice a day. The delivery pipe B, from the pump, is connected by the pipe B_2 to the pipe J joining the hydraulic mains to the tar-tower, at the opposite end to the tower. By this means, a stream of liquor is forced at considerable pressure from the end of the pipe J to the tower, thoroughly flushing-out the pipe and removing any obstruction. Besides, acting in the same manner as an injector, it has the effect, as each hydraulic main is open to the pipe J at all times, of drawing out any tar which may have accumulated in the box. The delivery of the pump is, of course, connected by the pipe B_2 to each section where a separate tower is in use. In one retort-house in which this arrangement is fitted, there are two benches—one with eight settings of ten through retorts, and the other with six similar settings. Each bench is fitted with four towers; so that in all eight connections are made for the delivery of the pump.

Outlet Pipe.

It was necessary in this installation, owing to the absence of head-room, to lay the outlet pipe J from the boxes perfectly level, and at the side of the box, though on a level with the bottom, instead of underneath. There being no fall, trouble was anticipated; but in practical working no trouble whatever is experienced—the tar flowing away quite freely, and the liquor finding its



A. Suction pipe on circulating liquor pump. B. Delivery pipe on circulating liquor pump. B1. Delivery pipe to supply tank. B2. Delivery pipe for flushing tar and liquor pipe J. C. Liquor supply pipe. C1. Liquor supply pipe to tar-tower. C2. Liquor supply pipe to hydraulic main. D. Liquor overflow from tower. E. Condensation pipe from foul main. [This pipe is connected to the bottom of the foul main in the centre of each bench.] F. Overflow from supply tank. G. Overflow from receiving tank. H. Tar run-off pipe from receiving tank. I. Tar run-off pipe from tar tower. J. Connection pipe for tar and liquor between hydraulic mains and tar tower.

It should be explained that many of the pipes—such as B2, C, D, E—by means of branches, do duty for the entire installation of eight towers. There is only one supply tank, one receiving tank, and one pump to each retort house; and each tar-tower is only connected to three or four hydraulic mains. In the drawing, the hydraulic main furthest from the tower is shown; so that the functiou of the flushing pipe B2 from the pump may be more clearly explained.

Arrangement of Tar-Towers.

way into the hydraulic mains without difficulty. The absence of any trouble is, in the opinion of the writer, due to the working of the pump. Should any thick tar choke up the outlet from one of the hydraulic mains, it may be easily cleared by shutting the cocks on each of the other boxes in this particular section, leaving the choked box open, and then forcing a passage into the box by means of the pump. Having done this, the tower is nearly emptied, having first closed the valve on the pipe J. This valve is then opened, causing the liquor to run out of the hydraulic main with considerable force, carrying with it the thick tar. It is only on rare occasions that this procedure is required; and the cause of the stoppage would appear to be due to tar accumulating in the top of the bridge-pipe and finally falling, when congealed with the heat, into the box.

Hot Liquor.

To revert to the advantages of the tanks, it is found that, as would be anticipated, the liquor, after circulating through the hydraulic mains, becomes very hot. If this liquor were allowed to run direct into the storage tank, and fresh liquor were pumped into the supply tank, the whole of the liquor storage would speedily become heated to a serious extent, and result in much ammonia being evaporated. If cold liquor is used to supply the tar-towers, and through them the hydraulic mains, this cold liquor, to a certain extent, takes the place of the condensers; and much of the heat of the gas is absorbed by the liquor. But if the hot liquor condensed in the retort-house only is used for this purpose, and is circulated over and over again (only the surplus being allowed to run away) the gas is not cooled to any extent, owing to the liquor being nearly as hot as the gas; and thus the liquor in the main storage-tank is not heated to any considerable extent. For instance, the gas leaving the hydraulic main is found to be about 140° Fahr., while the liquor in the two tanks varies between 120° and 130° Fahr. (during the winter months); but the temperature in the main storage-tank is 80° Fahr. or under. There would, of course, be much loss of ammonia in the retort-house were the tanks not securely covered. This is most important. A typical test of liquor in circulation is as follows: Free ammonia, 4 oz.; fixed ammonia, 8·4 oz.; total, 12·4 oz.—showing the effect of circulating the liquor in the hydraulic mains.

Alterations to Hydraulic Mains.

Two alterations were made to the existing hydraulic mains, to render them suitable for working with liquor seals and tar-towers. Firstly, the hydraulic mains being square shaped and flat on the bottom, it was thought advisable to make a good fall from each end to the middle, to ensure the tar flowing to this point. For this purpose, the hydraulic mains were filled with concrete, as shown in the drawing. Secondly, the gas outlet from the hydrauiic main being placed on the side and the dip-pipes being somewhat short, it was necessary to prevent any liquor from flowing away with the gas. This was satisfactorily effected by fixing a special casting over the gas outlet on the inside of the hydraulic main. By this means, the gas outlet was raised several inches above the level of the liquor.

Equilibrium Pipe.

It is the usual custom to fit a pipe between the foul main and each tower to maintain an equal vacuum in each, and so ensure that the liquor in the hydraulic mains, which are under the same vacuum as the foul main, and the liquor in the towers, are kept at the same level. In the writer's installation, this has not been done, for the reason that it is an easy matter to arrange that the overflow in the tower shall be fixed at such a point as will give any desired seal in the hydraulic mains. The tower is covered at the top by a plate securely bolted down; and on the plate is fitted a 3-inch flange, into which a plug is screwed. This is to all intents and purposes tight, and does not allow the ammonia to escape, but not sufficiently so as to prevent atmospheric pressure being maintained in the top of the tower above the liquor. The consequence is that the liquor in the tower and that in the hydraulic mains are at different levels; but the difference is known, and is allowed for.

The objection to an equilibrium pipe—and the writer has tried it—is due to the fact that it is necessary to examine the overflow in the towers at fairly frequent intervals, to ensure that the liquor is overflowing at the proper rate. If an equilibrium pipe is fitted, this must be shut each time the cover is opened, to prevent air being drawn into the foul main. If this is always done, there is no great objection to it; but it is preferable to eliminate as far as possible any opportunity for carelessness. It is, too, an objection that with an equilibrium pipe as soon as the top of the tower is open to the air, instead of being under a vacuum, the liquor immediately takes up a different level to that when the cover is again fastened down; and for this reason the man in charge cannot be sure that the liquor is actually overflowing when the top of the tower is again under a vacuum.

Labour Required.

To ensure the satisfactory working of the system, it is necessary to have a man constantly in attendance; but it is quite possible for this man to attend to other duties. In the writer's installation, there are eight towers in each of two retort-houses, and two upper and two lower tanks in all. Both retort-houses are worked, as regards the tar-towers, &c., by three men, each in charge for eight hours; while one man, in addition, thoroughly overhauls the whole system in the two retort-houses during the daytime, to ensure that all the pipes and hydraulic mains are quite clear. The three-shift men are also responsible for clearing the bridge-pipes and dips in both retort-houses when required—working in all cases, of course, under the direction of the retort-house foremen.

In connection with the circulation of hot ammoniacal liquor here described, the writer proposes to deal in a future article with the advantages to be derived from this method of working, in relation to its apparent effect on the diminution of sulphur compounds in the gas.

Analysis of the Accounts of Water Undertakings.—The "Analysis of the Accounts of Some of the Principal Water Undertakings of the United Kingdom" for the year 1909-10, compiled by Messrs. Wood, Drew, and Co., Chartered Accountants, is now ready. This is the thirtieth year of publication; and the nature of the work is well known to those of our readers who are connected with the management of water-works, to whom it is as valuable as "Field" is to their gas colleagues. The accounts dealt with are those of the Metropolitan Water Board for the two years ended March 31, 1909 and 1910, and of 23 Provincial water undertakings for the latter year—being one less than last year. The "Analysis" is presented in the same form as its predecessors.

PASSING OF THE ILLUMINATING POWER TEST.

In the "Journal de l'Éclairage au Gaz" for the 5th inst., M. André Grebel, whose abacus for calculating the flow of gas in pipes was given in the "JOURNAL" a fortnight ago (p. 104), dealt at some length with the subject of the supersession of the illuminating power test of coal gas by a calorific power test. The following is a translation of the main portions of the article.

In a previous article, the author showed that the first blow had been struck against the old-fashioned method of Dumas and Regnault of estimating the value of coal gas. This method, which is based upon the luminosity of the open flame of a Bengel burner, is not a measurement of any physico-chemical property of gas apart from the readings of the particular instrument employed; and there is no valid reason for its continued adoption. Moreover, under modern conditions of manufacture, and with the coals at present available, it is no longer possible to maintain the Paris standard of 105 litres per carcel-hour (3·7 cubic feet for 9·6 candles). The old method of testing gas being threatened, it is necessary to seek a new one. Paris, which is at the same time the seller and the buyer of its supply of gas, and is therefore in a position to revise the terms on which the commodity is sold, has just adopted as a standard the net calorific power of gas. We must not, however, immediately cry out that the victory has been won, especially if it is intended to impose an absolute minimum of 4700 calories per cubic metre [say, 522 B.Th.U. per cubic foot] on all French gas-works. To adopt so high a calorific standard would be to bring into use just as extreme a method as the photometric standard of Dumas and Regnault, as will be shown later. Consumers using gas for heating and cooking purposes will naturally welcome a calorific standard; those employing incandescent gas-burners will wish to have a measure of the heat of combustion of the gas as an indication of its lighting power; while a gas maker will approve of a method which would estimate the quality of the gas by some mean quantity devised with due regard to the fact that the chief application of gas is in incandescent burners. A discussion of the considerations to be kept in view in adopting a new standard therefore seems desirable.

Of the many physicists and others who have attempted to establish a theory of incandescent lighting, none have arrived at one which is completely satisfactory or precise; and many have drawn quite misleading, and often contradictory, conclusions from their own researches. To argue that, because the incandescent problem is complex, we should be content with a purely calorific standard, is an obviously simple solution of the difficulty. But this is the way in which the adoption of the high figures already mentioned has been met—figures which it will be more difficult to maintain in the immediate future than it has been, during the last few years, to maintain the illuminating standard fixed in 1860. Though the problem is a difficult one, the author believes that it is possible to obtain from the work of MM. Le Chatelier and Boudouard, Féry, Bunte, and others, a solution which is more precise than that which is current at the present time. For this, in the first place, it is advisable to separate the study of the mantle from that of the source of heat.

According to M. Féry, the radiation of the ceria alone is greater than that of a black substance or the Kirchoff unit of radiation, since it absorbs gases which afterwards enter into combustion at a higher temperature. This catalytic action—to which Bunte in 1898 gave great prominence, only to reject it in 1903—is the subject of much discussion. In order that the ceria should exercise its selective qualities, in consequence of which its luminous radiation increases more rapidly than its total radiation, it requires to be brought to a high temperature. This would be the part played by the thoria, which, with its very low emissive power, would provide the heating substance, the support for the radiating body proper—viz., the ceria. Whatever may be the particular properties of the ceria and the thoria, which separately have, so to speak, no brightness, it may be admitted with Le Chatelier and Boudouard that the Welsbach mixture at ordinary temperatures behaves as a coloured body. Its great efficiency arises from the fact that its emissive power, very high in the case of the blue, green, and yellow rays, is less in the case of the red and infra-red rays. The proportion of total radiant energy is less than that of a black body; but it is greater in the visible part of the spectrum. This phenomenon of selection of radiant energy comes into what is called luminescence. One fact of current observation, which no one will be prepared to deny, is that heated solid bodies become more luminous as their temperature is raised. According to many authorities, the luminous intensity of the Welsbach mantle increases at least as the fifth power of its absolute temperature—that is to say, of the temperature in degrees centigrade *plus* 273. This law is of general application; it applies to temperatures of combustion of different gases as well as to different temperatures obtained with the same gas. The temperature of the mantle (t) is a little different from that of the naked flame (T). The difference is less as the hourly consumption of the gas burnt or the calories produced under a given mantle is greater, since the temperature which a heated body attains in a flame depends: First, on the temperature of the flame; secondly, on the speed of the current of gas; and, thirdly, on the specific emissive power of the substance heated. Herr Bunte found that in the case of ordinary burners the difference between the temperature of the naked flame and that of the mantle is 145° C.; so that the absolute temperature of the mantle ($t + 2730$) is not very different from that of the naked flame. As regards the maximum luminous efficiency produced, which may be expressed either (1) by the highest value of the ratio of the intensity to the consumption of gas, or of the intensity to the calories produced, or (2) by the lowest value of the ratio of consumption to intensity, it will be understood that it does not necessarily coincide, even if the burner is perfectly regulated, with the maximum of luminous intensity, or with the brightness of the mantle. The useful effect of increasing the hourly consumption of gas, starting from a certain instant, can no longer counterbalance the increase in the loss by heat radiation, although the increase in luminous radiation may be more rapid.

No reference will be made here to the advantageous action of reducing flames on the radiation of the ceria, studied by M. Féry, since we have to do with the mixture of ceria and thoria, in the case of which it seems that the maximum brightness corresponds, as a rule, with the admission to the burner of a proportion of air very close to that required theoretically for perfect combustion. The recuperative burners consume almost as complete a mixture of air and gas as this, and their mantles are extremely bright. It should be noted that the temperature of the flame, and therefore of the mantle, varies in different parts. Owing to the changes which take place in flames, that of a gas containing hydrogen, under ordinary conditions, will not exceed, nor even reach, 2500° C., the temperature at which steam is decomposed into oxygen and hydrogen. Yet chemists of high standing talk of the theoretical temperature of combustion in putting forward their explanations of incandescence.

Another matter of importance is the quantity of heat produced per hour under the mantle. This amount can only serve as a means of comparison when dealing with gases very similar in composition. Doubtless it is highly attractive to think of it as practically dependent upon the temperature of the flame; but, as a matter of fact, the speed of propagation of the flame varies with the temperature. In a given mantle, one can pass more of the mixture of air and gas, or more calories, only if the combustion is more active. And in order that the flame should not leave the burner or pass back into it, it is necessary that the speed with which the mixture escapes should be about that of the propagation of the flame. It can be said that the mean maximum temperature of the flame stands in a definite relation to the calorific power of the gas and the quantity of air required. Thus with water gas of 2600 calories, but requiring only 2½ volumes o air for its complete combustion, temperatures of about 1800° C may be obtained just as readily as with coal gas of 5100 calories requiring 6 volumes of air. [See table.]

These facts afford an explanation of the opinion expressed by M. Emile Sainte-Claire Deville (confining his experiments to coal

Co-Efficients of Combustion of Different Gases.

—	Acetylene.	Benzene.	Methane.	Hydrogen.	Illum. Gas (Average).	Carbonic Oxide.	Pure Water Gas (Average).	Coke-Oven Gas (Average
Weight of 1 cubic metre of gas or vapour at 0° C. and 760 mm. . . . . kilos.	1·162	3·486	0·715	0·0895	0·52	1·251	0·86	1·26
Calorific power (steam condensed) per cubic metre . . . . . calories	13,881	36,016	9547	3062	5000	3055	2600	1100
Calorific power (steam not condensed) per cubic metre . . . . . calories	13,398	34,566	8581	2578	4600	3055	2400	1060
Volumes of air required for complete combustion of one volume of gas or vapour	11·942	35·827	9·556	2·389	6·0	2·389	2·5	1·0
Calorific power of one cubic metre of theoretical self-combustible mixture (steam not condensed)	1035	938	813	760	657	901	686	530
Mean temperature of flame in non-recuperative burner . . . . . Deg. C.	2400	..	..	1900	1740	..	1775	1300
Speed of ignition of theoretical mixture with 2 per cent. of oxygen in excess . . metres	6·15	..	0·60	4·50	1·25	2·00	..	..
Consumption per carcel-hour in upright incandescent burner . . . . . litres	3·0	..	..	..	12·0	..	11·0	..
Consumption in calories per carcel-hour . . .	40·2	..	..	..	55·2	..	26·4	..

gases of more or less rich quality), that the lighting power of gas produced by incandescence is proportional to its calorific power. This empirical law holds good within from 10 to about 20 per cent. for gas resulting from the distillation of coal, owing to a series of coincidences. The poorest gases, rich in hydrogen, require less air for combustion. But it is utterly fallacious when applied to other gases, though its author has sought so to extend it. Without wishing to labour the point, emphasis must be laid on the false dicta that the best gas for incandescent lighting is the one richest in calories, and that only the calorific power test is necessary for judging the quality of a gas. The foregoing table, in which are collected the different coefficients of combustion of the principal gases (derived, for the most part, from papers which the author has already published), will suffice to dispose entirely of conclusions of this nature.

It will be seen from the table that there is marked parallelism between the mean temperatures of the bunsen flames and the inferior calorific powers of the unit of volume of their self-combustible mixtures. The more rapid increase of the speeds of ignition is no less marked; and with regard to the rule of M. Sainte-Claire Deville, it is seen that it is extremely limited in its application. According to it, the consumption per carcel-hour of incandescence is 23 litres (0·81 cubic foot) in the case of water gas and 4·3 litres (0·15 cubic foot) in that of acetylene, compared with 12 litres (0·42 cubic foot) for coal gas. The average results of daily experience are opposed to these figures. On the other hand, the table shows the coincidence of consumptions with the fifth power of the temperature of the flame, or, if it is preferred, with the fifth power of the calorific power of the cubic metre of the theoretical mixture for perfect combustion. The superiority of luminous efficiency in incandescent burners using carbon monoxide over that of burners using hydrogen is easily explained by the difference between the latent heat of the self-combustible mixtures of the two gases. From all the comparisons, one is right in assuming that carbon monoxide is highly favourable for incandescent lighting.

According to a recent investigation carried out by the authorities of the town of Ghent into the conditions upon which gas is supplied in the principal towns in Belgium, France, England, Holland, and Germany, the illuminating power of gas, as a general rule, has lost its importance compared with calorific power and with the proportion of water gas mixed with the coal gas. In Holland, for example, the admixture of water gas varies from 25 to 40 per cent. Many recent contracts allow 20 per cent. of carbonic oxide, which is equivalent to the use of slightly more than 30 per cent. of water gas. Municipalities who have been afraid to sanction the use of this modern aid to gas manufacture are thus shown the error of their ways. But if the authorities insist on a calorific standard above 5000 calories gross, the use of substitutes for coal gas will be more stringently forbidden than by imposing a maximum for the proportion of carbonic oxide. It is difficult to understand the policy of arrogant bureaucracy which restricts the addition of water gas, methane, or hydrogen, since these gases furnish excellent results with incandescent lighting—better even than coal gas itself.

In opposition to what has recently been stated, the addition of volatile hydrocarbons can never raise the calorific power of gas to a great extent. When starting with a gas of 130 litres to the carcel and 4450 calories net, it is easy to bring it to 105 litres by the addition of 25 grammes of benzol per cubic metre. But the calorific power after this carburetting process is 4655 calories—an increase of only 205 calories. During some tests made with a Junkers calorimeter, the author found that the addition of 1 gramme of benzol per cubic metre of more or less rich coal gas raised its value from 1 to ½ litre—say, from 0·8 to 0·5 litre—but increased its calorific power by only about 2 per cent.

With coal which is of bad quality, or which has been exposed to the weather, gas managers would find more difficulty in complying with a specification for gas of more than 4600 calories net than with one stipulating 105 litres to the carcel with a margin of 5 or 10 per cent. In view of the gradual disappearance of satisfactory gas coal and of the increase in consumption, it is certain that within ten or fifteen years, possibly sooner, managers will find it practically impossible to fulfil such conditions. Therefore, in the author's opinion, with the object of avoiding disputes with the inspecting authority, the standard which should be adopted in the revision of old contracts should be one of a minimum of net calorific power not exceeding 4400 or 4300 calories, and a minimum of temperature of combustion measured either directly in a bunsen flame under certain precise experimental conditions, or calculated from the calorific power (products of combustion above 100° C.) of the self-combustible mixture, which latter would lead to the second problem—viz., the determination of the volume of air necessary for perfect combustion. The rights of the consumer who uses gas invariably for lighting and frequently for cooking and heating would thus be respected, and gas managers would no longer be saddled with the task of conforming to conditions which are incompatible with existing manufacturing processes and the present nature of coals.

Recent Wills.—Mr. William Young, one of the Directors of the Salisbury Gas Company, left estate of the gross value of £47,398. Mr. Joseph Edward Riley, of Arden Hall, Accrington (late head of the firm of Messrs. John Riley and Son, chemical manufacturers), who died on the 24th of December, left estate valued at £135,170 gross, of which £129,722 is net personalty.

ELIMINATION OF SULPHUR FROM COAL GAS.

By G. Stanley Cooper, B.Sc.

In the Examiners' reports on the quality of London gas issued recently, it is stated that the amount of sulphur in the gas supplied to the consumer may be anything from 30 to 60 grains per 100 cubic feet. Taking—as one should be justified in doing—London gas as among the best supplied in the country, one would not be greatly surprised to find that in poorer provincial companies the amount of sulphur runs up to 100 grains per 100 cubic feet. The London Gas Companies have the best of everything at their disposal, and can afford to pay for purification and testing. Further, they have ample scope for experimental work in the direction of finding suitable methods for dealing with their own particular trouble. Smaller works, on the other hand, have to fight their equally stern battle with only limited resources at their command, and the quality of their gas must, of necessity, suffer accordingly.

There can be no doubt whatever as to the undesirability of the presence of sulphur in coal gas, because of the obnoxious character of the products it gives rise to on combustion. Sulphurous and sulphuric acids ought to be eliminated if possible; and this becomes increasingly important in commercial concerns where a large quantity of gas is consumed. Thirty-two grains of sulphur can give rise to 98 grains of sulphuric acid; and if the commercial consumption of gas is to increase to the desired extent, this factor will have to be considered. A small gas-furnace will soon use up 100 cubic feet of gas; and if it can be argued that this involves the attendant production of at least 98 grains of sulphuric acid, it will not tend to add to the popularity of this branch of the gas industry. People are very sceptical nowadays about accepting anything for their own use which is said to affect the purity of the air; and once a prejudice in this direction is set up among likely customers, it will take a good deal of work to remove it. It has been shown recently, as many readers of the "Journal" are aware, that the proportion of sulphur in the air is affected very little by gas consumption—that a room in which coal is burnt contains quite as much sulphur as one in which gas is being consumed. All this may be true; but it is not the least excuse for the continuance of this sulphur production if it can be remedied. In the opinion of the writer, it is not beyond the compass of gas engineers to diminish the amount of, if not to remove entirely, the sulphur contained in coal gas.

It has been suggested that the regulations concerning the testing of gas for sulphur compounds are most inconsistent. Sulphur is just as harmful whether it occurs as sulphuretted hydrogen or in any other compound. Yet the test for sulphuretted hydrogen is very strict indeed, and no test at all is enforced for other sulphur compounds. In considering this question of sulphur impurities, it is necessary closely to study the nature of the compounds which sulphur can form and are likely to occur as such in coal gas. The best known of these are sulphuretted hydrogen and carbon bisulphide; and these are inorganic bodies. Others, less known, but perhaps more important, are those organic compounds, such as thiophen, &c., which cannot easily be removed directly. It is the latter class of substances which are largely responsible for the presence of the sulphur left in "purified" coal gas. Carbon bisulphide is often present, and can be recognized by the ordinary qualitative tests. It is a matter of difficulty to detect, as such, the organic compounds of sulphur in coal gas, as they are present in such small quantities. The presence of sulphur can, however, be shown by the Referees' sulphur test, whereby the gas is burned and the impurity converted first into sulphate of ammonia and finally into barium sulphate. This test, however, serves only for analytical purposes, and cannot therefore be used as a means of eliminating the sulphur. The following device is an old one, and certainly is workable on a small scale. Its successful application on a large scale would be very beneficial to the gas industry.

Clay has the power of acting as a catalytic agent in certain reactions—that is to say, it can bring about chemical reaction between certain substances without undergoing any apparent change itself, and, moreover, the reaction brought about would not take place under ordinary circumstances. Thus hydrogen and carbon bisulphide do not react under ordinary conditions. If, however, they are passed over clay, a reaction takes place with production of some sulphuretted hydrogen. Certain organic compounds of sulphur react in a similar way and, again, the sulphur is eliminated as sulphuretted hydrogen—a form in which it can easily be extracted from coal gas.

Some years ago, Dr. Bowditch suggested a very interesting connection between the sulphur question and the deposition of various substances such as tar, naphthalene, &c., in the mains. His suggestion was that, owing to imperfect separation, a certain amount of tar vapour and naphthalene were carried forward through the holders. Some of these substances were deposited in the mains, while some were consumed at the burners. This tar might be the agent by which the sulphur compounds are retained in the gas. Naphthalene would, of course, act in a similar way. That is to say, then, that these substances act as a kind of gaseous solvent for the various sulphur compounds, and so help to prevent their removal by other means. If this supposition is correct, traces of sulphur compounds should be found in the substances deposited in the mains; and Bowditch did find, on distilling the naphthalene which had been deposited, that he could get distinct tests answered for sulphuretted hydrogen.

To confirm the above, the writer obtained specimens of crude

naphthalene which had been deposited in various parts of the mains, and subjected them to steam distillation in a current of coal gas. The coal gas was used in order to carry forward any gaseous products which might be set free during the distillation of the naphthalene; and it was led into a standard solution of lead acetate. About 10 grammes of naphthalene were distilled each time; and traces of sulphuretted hydrogen were indicated in all cases by a slight discoloration of the lead acetate solution. This reaction by no means accounts for the 30 grains or more of sulphur always to be found in each 100 cubic feet of gas; and it must further be borne in mind that this sulphur is associated with substances of an entirely different character from carbon bisulphide and sulphuretted hydrogen. Even with perfect filtration of tar and the separation of naphthalene, these sulphur compounds will still remain; and if they are to be removed eventually by a simple purification process, much modification will be necessary. Re-heating the gas has been tried in America; and by this means the sulphur content has been brought down to 13 grains per 100 cubic feet. The ultimate aim should be to bring it down to zero, and to be able to control it with the same certainty as the removal of sulphuretted hydrogen is controlled at present.

USE OF TAR ON ROADS.

In connection with the abstract given last week (p. 168) of the two papers recently read at the Institution of Civil Engineers, on the use of tar for the improvement of road surfaces, the following remarks made by Mr. C. W. Ross, the Street Commissioner for West Newton (Mass.), in the course of a contribution by letter to an informal discussion on "Road Construction and Maintenance" at the American Society of Civil Engineers, are worth reproduction from the "Proceedings" of the Society.

The last few years have witnessed an increased use of various materials for the treatment of roads, with a view to their preservation, as well as to the prevention of dust. The methods have been of two classes—viz., by improved processes of road construction, and by surface treatments. With the advent of the automobile, new conditions confronted road engineers; and they were forced to decide at once whether they would use materials for simply suppressing dust—such as oils or emulsions which act partly as binders—or bituminous liquids which would prevent wear and disintegration by forming a water-tight wearing coat.

The prevention of dust offers two distinct problems: In the first place, the question naturally arises as to the methods to be adopted in the construction of new roads in order to bring about the desired properties of freedom from dust and low cost of maintenance; and the second problem is that of the treatment of roads already in existence, to prevent wear and disintegration. There are two general methods by which such roads are treated to remedy the dust nuisance, although it is difficult to draw a definite line between them. The first is by sprinkling the surface with any of the emulsions; the second is by treating the road with a binding material, so that only a minimum amount of dust will be formed. The first method of suppressing the dust is of necessity a temporary expedient. Water, salt solutions, light oils, emulsions, &c., come properly in this class. In the second method, it is obvious that the essential properties in a preservative are its binding power and durability. For this reason, and by way of distinction from temporary treatments, materials for this purpose can be properly called permanent binders. Such materials as tar and heavy asphaltic oils are included in this class. It must be pointed out, however, that the word "permanent" is only used in a relative sense; and that binders which on application will last at least one whole season are included under this head.

The principal agencies which tend to cause deterioration on tarred and oiled roads are frost, heavy rains, and decaying organic matter on the surface of the road. In the writer's opinion, the last-mentioned cause is more destructive than any of the others; and, for this reason, after a street is treated it should be swept, by hand sweepers or otherwise, often enough to keep it clean. Oil, as a rule, penetrates better than tar. But its value is in the asphalt base; and before the maximum binding power is reached the more volatile constituents of the oil must evaporate, which is a slow process. Too much stress cannot be laid on the fact that the street must be thoroughly clean before any of the material is applied. It is not necessarily advisable to have the road surface absolutely dry; practice having shown that the oil has a tendency to adhere to the dry dust on the road. This can be prevented by sprinkling the surface with water two or three hours before the work is to be done. The oil then penetrates, and prevents the pulling up of the oil and sand.

The writer has tried most of the asphalt preparations in use at the present time for preserving the road and rendering it dustless. Since adopting the new methods of work, large quantities of asphaltic oils, "tarvia," "tarite" asphalt, and standard macadam binder have been received.

The idea of applying tar to the surface of broken-stone roads probably originated with an Italian physician, Doctor Guglielminetti; the method being first applied to the streets of Monaco. The first authentic mention of a practical application of coal tar to the surface of a completed macadam road was in 1880, when a street near Bordeaux was given a surface treatment. The results were unsuccessful; but six years later a similar experiment was made at Melbourne, with so much better results that the practice was continued. More care was taken in this experiment—the road surface being first cleaned; and after the tar was applied, the road was given a covering of fine crushed stone. The results showed that tar had considerable value as a dust layer by cementing the surface of the road together, thereby preventing its deterioration. The wear on the road was diminished, and consequently the cost of maintenance was very materially reduced. Since that time, other experiments have been tried, in France, England, and the United States.

The use of tar on road surfaces in the United States has been confined largely to the East and North, except in a few instances where the park authorities in the larger cities have made some experiments. One of the first experiments of any importance was made at Jackson (Tenn.), in the summer of 1905. The United States Office of Public Roads, in co-operation with Mr. Samuel C. Lancaster, the City Engineer of Jackson, made a series of careful experiments to determine the value of coal-tar treatments on broken-stone roads. These experiments created such widespread interest that similar ones were made in different sections of the country. The State of Massachusetts was among the first to use "tarvia;" a number of cities in the vicinity of Boston, as well as the Metropolitan Park Commission and the State Highway Commission, treating several miles of roadway. At about this time, Rhode Island and New York were using the material named and other tar preparations on their roads and streets with good results. The foregoing experiments show conclusively that a tar specially prepared has given better results than any of the crude tars in use up to the present time.

In Newton, the first "tarvia" was used on a section of the boulevard, in September, 1906. The bed of the road was first repaired and shaped up. The area covered was 3500 square yards; and the cost was 14 c. per square yard. This section has not received any repairs, and is apparently in first-class condition in every way. In 1907, a section of a road, the macadam surface of which had become badly worn, was treated as follows: It was spiked up with the roller and covered with a light grouting of 1 to 2 of portland cement mortar, which was spread evenly over the entire surface, and penetrated into the stone in such a way as to bind the whole material together. It was then smoothed off with large street-sweepers' brooms. The road was closed for about four days, giving the cement time to set. After this it was opened to traffic and used for about a year. Then the surface was swept with an ordinary horse-sweeper, and covered with a thin coating of "tarvia," heated to a temperature of about 170° Fahr., which adhered readily to the cement, giving a smooth and satisfactory surface. This is still in first-class condition, after a period of about 3½ years. On a small portion of the same street a second coating of cement grout was applied and covered with "tarvia." This experiment was for the purpose of ascertaining whether the materials would adhere and form a satisfactory surface. It has proved to be all that was expected.

In recommending the use of the different tar treatments, it is well to bear in mind that they are better adapted to macadam than to gravel surfaces, because the surface is likely to become broken unless the foundation is solid enough to carry the load. And, once broken, deterioration is very rapid. The asphalt oils, however, can be applied to either. They stand the winter weather without breaking, and in the spring are as smooth as when built.

"Transactions" of the American Gas Institute.

We have received the volume of proceedings of the American Gas Institute for the past year. It contains the papers submitted at the fifth annual meeting, held in New York on Oct. 19, 20, and 21, under the presidency of Mr. William H. Bradley, the Chief Engineer of the Consolidated Gas Company of New York, with reports of the discussions thereon and of the general business; also the reports of the various Special Committees. The principal technical subjects brought before the members have already been noticed in the "JOURNAL." A useful feature of the volume is the collection of "Wrinkles," which, as well as the papers, are freely illustrated. The rest of the contents comprises the constitution and bye-laws of the Institute, and lists of the officers, committees, and members. As usual, a portrait of the President for the year forms a frontispiece to the volume, which has been produced under the editorship of the Publication Committee.

Retaining Walls.—At a recent Students' Meeting of the Institution of Civil Engineers, Mr. E. E. Farrant read a paper on "Retaining Walls." The author described the various theories in common use for the determination of earth pressures, and (with the aid of lantern slides) described several works that had actually been carried out—calling attention to the various features which had been embodied in their design to meet the conditions under which they were required to act. Messrs. Meade, Freeman, Hutt, Reid, Reynolds, Brims, Taplin, Clark, Hart, and Kynnersley took part in the discussion following the reading of the paper. The Chairman (Mr. E. P. Hill), remarking on the great differences in the values found for the earth pressure by the use of various formulæ, stated that for this reason it was usually found desirable in practice to construct walls on lines somewhat heavier than those indicated by theory to be necessary.

YORKSHIRE JUNIOR GAS ASSOCIATION.

An Ordinary Meeting of the Association (the closing one of the session) was held at the Halifax Gas-Works on Saturday—the President, Mr. F. Scholefield, in the chair. Unavoidable circumstances had caused a change in the subject of discussion and the place of meeting; and Mr. C. D. Cawthra, of Halifax, earned the warm thanks of the members for coming forward, at short notice and considerable personal inconvenience, and in so ably filling the bill. The address was made clear to the listeners by a series of large copies of the curves on which his observations had been plotted, drawings of the hydraulic mains referred to, and specimens of the various types of the carbon, tar, and pitch deposits referred to.

NOTES ON STOPPED ASCENSION PIPES.

What I have to say on an old subject is just a recital of a few points which, in the course of my work, I have had to investigate, and from which, rightly or wrongly, I have drawn certain deductions which have some bearing on certain assertions that have been made and reiterated so often that we may be prone to accept them in a sense which leaves us with a somewhat distorted idea of their true application.

For instance, I may quote from a well-known book for gas students: "With regard to the stoppages in ascension pipes, it is considered that the cause of such stoppages is due to high heats and to the pressure caused by the hydraulic. The remedy is to keep the pipes cool, and to have as light a seal as possible, and the dip-pipe to dip in liquor only." The idea that high temperature carbonization is conducive to stopped pipes is in a general sense quite correct. The suggested remedies are also in every way excellent, and when adopted will mitigate the trouble to a very great extent. But I hope to be able to show: (1) That these troubles are not directly due to the high temperatures necessarily required for successful up-to-date carbonization, but to certain contingencies which arise under working conditions. (2) That some degree of trouble is unavoidable.

Those of us who have had much to do with stopped pipes know that the obstructions do not all exhibit the same characteristics. Most often they are of a pitchy nature, varying from a hard baked (almost carbon) formation in the hotter portions of the ascension pipes to a thick deposit of the consistency almost of india-rubber in the cooler parts. Frequently, also, in the bridge and dip pipes deposits occur which consist of practically pure carbon or lamp black, and have the appearance of dry, light soot. These as a rule are very troublesome, as they are difficult to remove without a little getting into the hydraulic. The deposit also seems in cases to be continued to an extent in the main, where the carbon mixes with the tar and, unless removed, speedily forms pitch.

Stoppages of this kind form very quickly; only a few hours being necessary to completely block a pipe. The real cause of stopped pipes is, I think, primarily the exposure of the gas to extremely high temperatures—thus splitting up the hydrocarbons into simpler hydrocarbons and free carbon. It is this free carbon which chokes the pipes. As the tarry vapours condense upon the ascension pipes, the carbon is deposited along with them; while in the later stages the tar is once more vaporized, carbon and pitch are left as deposits on the inside of the pipes.

But how is it that, with a score or more beds working on the same coal, at similar temperatures, and under the same general conditions, the majority of the pipes never give any trouble, while isolated ones require the most constant attention, and then from time to time block up? It is from this point of view that I wish to consider these troubles; and I therefore assume that the hydraulic main arrangements are of satisfactory design, that a liquid seal is maintained, and that regular and sufficient attention is paid to the pipes and mains—essentials without which anything like efficient working is impossible.

Under the conditions that I have here laid down, I believe that stopped pipes are almost entirely due to too high a temperature in the ascension pipes; and I suggest that this condition is chiefly the result of:

1.—A retort temperature in excess of that required for the carbonization of the coal.
2.—Leaky retorts.
3.—Excessive pull on the retorts.

Dealing with the first of these conditions, the excessive temperature may arise from several causes. Different coals require very different degrees of heat to effect their complete distillation; and on works where several classes of coal are carbonized, it becomes necessary to work the retorts at a temperature sufficiently high to deal with the coal requiring most heat. If, then, there is for some time delivery of coals requiring the lower temperatures, the retorts are too hot for the work they have to perform, and, further, during the time these coals are being dealt with they will gradually become considerably hotter. To regulate the heats to allow for these changes in quality, where there are a fair number of beds working, is not practicable, as at any time coal requiring the higher heats may again have to be dealt with.

Of course, in the case of horizontal retorts the charges may be made heavier, and so, by giving the retorts a little more work to do, the temperatures may be kept down; but with inclined retorts (to which, I may say, my remarks are chiefly intended to apply), this course cannot be adopted with any degree of success.

Light charges are another cause of excessive heat; and, unfortunately, in the last stages of the life of inclined settings, they are almost unavoidable, owing to the irregularities in the bottom of the retorts preventing the full charges from being put in. When only one or two retorts in a bed are sufficiently bad to cause this obstruction to the even disposal of the charge, it is not desirable to reduce the heats on the bed, as, if this were done, the normal charges in the remaining retorts would not be thoroughly carbonized and gas would be lost.

A third cause, but one which in a properly-designed and worked setting is avoidable, is the local overheating of one or more retorts in a bed. This cause is similar in character to the second, but is brought about by entirely different circumstances—one due to retorts which have nearly run their working life, the other to an improperly designed and worked setting.

Turning to the second suggested cause—leaky retorts—I can, from personal experience, speak as to the great difficulty in maintaining the tightness of inclined retorts towards the latter end of their working days. Holes and very large cracks are frequently of such a nature, and appear in such positions, that it is practically impossible to make a satisfactory job of caulking. The trouble from leaky retorts is very general after a spell of scurfing, especially so in cases where the retorts are old, and such trouble generally continues until the cracks make-up with carbon.

The third cause I have suggested as being due to excessive pull on the retorts. I put it this way in preference to suggesting light seals, as from the aspect of stopped pipes I have not found that a slight variation in seal has any observable influence, so long as the pull is not excessive for the seal adopted. The following comparisons of beds working under the same conditions of pull will illustrate what I mean. The particulars were taken when the beds were under full fire during an eight hours' stand, with both the ascension pipe and hydraulic under atmospheric pressure, so that the actual dips were recorded.

Bed A.			*Bed B.*		
Dip-Pipe of	Dip.	Condition of Pipe.	Dip-Pipe of	Dip.	Condition of Pipe.
Bottom retort	1″	Clear	Bottom retort	$\frac{7}{8}$″	Clear
Middle ,,	1″	do.	Middle ,,	$1\frac{3}{16}$″	do.
Top ,,	$\frac{7}{8}$″	do.	Top ,,	$1\frac{1}{8}$	Sooty in bridge Pitch in main
Top ,,	$1\frac{1}{16}$″	do.	Top ,,	$1\frac{1}{8}$″	Clear
Middle ,,	$\frac{3}{4}$″	do.	Middle ,,	$\frac{7}{8}$″	do.
Bottom ,,	$\frac{3}{4}$″	do.	Bottom ,,	$1\frac{3}{16}$″	Pitch in bridge

The pull on the hydraulic main when working was 10-10ths, and the pipes in bed A gave not the slightest trouble, although there was a variation in the seal of $\frac{3}{4}$ inch. In the case of bed B, two pipes gave trouble—one with the heaviest and one with the lightest seal—while other pipes with similar seals were quite clear. We have therefore to look further afield for a cause of the trouble given by these pipes than in the seal or pull. As a matter of fact, the trouble in the bridge-pipe of the top retort was caused by holes which, owing to their position and character, we were unable to caulk efficiently, and in the pipe of the bottom retort by the fact that, as a result of irregularities in the floor of the retort, only a very light charge could be put in, and this did not get down within several feet of the mouthpiece.

Having then made the foregoing suggestions as to the causes of stopped pipes, where the general conditions are such that they only occur in isolated cases, it remains for me to bring some proof in support of my suggestions. The notes I propose to place before you are a part of the records of investigations made so as to enable us to arrive at the best method of working in the retort-house under the conditions of plant, &c., prevailing at our No. 3 works. The retort-house is equipped with 24 beds of inclined retorts, regenerator fired, in settings of six. Each retort is 20 feet through, tapering from 26 in. by 16 in. at the discharging end to 22 in. by 16 in. at the charging mouthpiece. The charges are $7\frac{1}{2}$ cwt. of six hours duration. Thus each bed carbonizes 9 tons per day. The hydraulic main arrangements I have already described.

When the 24 beds are working, two pipe-jumpers are engaged on each shift; and each ascension pipe is jumped every six hours, when opened out for charging. A 7-inch diameter augur is used, and run up to the top of the pipe. If the temperature in any ascension pipe has been excessive during the last charge, it may be found impossible to "get" or "jump" the pipe at this stage; and exceptions are made in these cases. From one to three hours after charging a retort, the ascension pipe will be found to be in the easiest condition for "jumping," as the tar, &c., which accumulates in the pipe is then in a fairly plastic condition. During the later periods of the charge, when the gas contains less of the lighter hydrocarbons, this deposit gradually becomes harder (due to the volatile portions being carried away by the poorer gas), and, in the case of a bad pipe, impossible to remove with the augur. Advantage therefore is taken of this fact to deal with the bad pipes during the earlier periods after charging.

Broadly, there are two methods of taking the tar away from hydraulic mains. One is by removing it automatically as it is made, of which the Dillamore tower is perhaps the best known illustration, and the other by allowing the tar to accumulate in

the bottom of the main and running it out periodically. When the latter method is adopted, it is essential that the tar should not be allowed to stop in the main too long, or it will become so thick that it will not run. In working the mains on this principle, we have found that, by running them off every eight hours, no trouble arises.

Some time ago, in re-arranging the working when only 14 beds were on, we tried twelve-hour intervals; but a short experience convinced us that, unless we reverted to the eight-hour arrangement, serious trouble was in store. By flushing the mains in this way every shift, we never have less than some 4 inches of liquor on the top of the tar. Observations, such as I have to show you, must, of course, vary considerably under different conditions of coal, retort temperature, and plant; but they were taken as far as is practically possible under the same conditions. In addition to the records of temperature, vacuum, and pressure in the retorts, ascension pipes, and hydraulic mains, observations of the make and illuminating power of the gas were also taken at five-minute intervals. But these I shall not deal with, as they have no bearing on our subject.

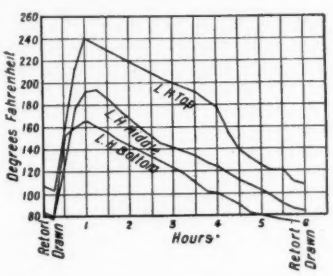


Diagram No. 1—Bridge-Pipe Temperatures.

Diagram No. 1 shows records of temperatures taken in the bridge-pipes just before the gas enters the hydraulic main. These readings were taken simultaneously on three pipes on the same side of the same bed; so that the conditions of working were exactly identical so far as coal and hydraulic main conditions were concerned. The dip-pipes were carefully levelled before and after the experiment; and the variation in dip was found to be less than $\frac{1}{8}$ inch. The temperatures of the retorts taken by means of Watkin's heat recorders were all found to be the same—1760° Fahr. just before charging. I have arranged the curves so that a reading taken on the same vertical line gives the temperature in each of the pipes at the same time after charging.

In referring to this diagram (No. 1), I would first of all draw your attention to a point upon which I find there is a certain amount of misapprehension, although it has frequently been alluded to in various papers and discussions, and is on record in Newbigging's "Handbook," to which I shall refer a little later. From the fact that the highest temperature is reached in the retorts at the end of the charge, it is very often, and very naturally, concluded that the highest temperature in the ascension pipe is also at the end of the charge. The diagram, however, disproves this conclusively. Rising rapidly from the time the retort is charged, it reaches its maximum about an hour afterwards, and then gradually falls (with temporary rises in some cases of a few degrees) to a minimum at the end of the charge not very greatly in excess of the surrounding atmosphere.

I must mention that the dip-pipe with the least seal before referred to was that of the top retort; and although the difference was so slight, it may have had some effect on the readings. The seal on this pipe when the record was taken was barely $\frac{11}{16}$ inch, and on the other two $\frac{3}{4}$ inch. The only other point in connection with this diagram to which I would draw your attention is that, as one would expect, the longer ascension pipes show the lower temperatures at the bridge-pipe. The method of taking the temperatures before you was by the insertion of thermometers through holes drilled in the pipes; the bulbs of the thermometers being in direct contact with the gas.

In Newbigging's "Handbook," there is a chapter on the "Temperature of Gas in the Retorts," where there are given records of four experiments made to determine the temperatures of the gas as it issues from the retorts, and it is stated that "the permanent gas at its highest temperature does not probably exceed 135° Fahr., though generated in a heat approaching 2200°." Of temperatures, obtained in the same way as those I have to show, at a distance of only 3 feet above the mouthpiece when the highest temperature recorded was 510° Fahr., Mr. Newbigging says: "Temperatures indicated were clearly not those of the gas. In attaining the higher temperatures, especially, the mercury rose by starts at the rate of 3° and 5° at once—evidently caused by hot particles of solid carbon or other solid or semi-fluid substances coming suddenly in contact with the bulb of the thermometer." In a later experiment, when, by means of a series of six discs of wire gauze fitted into the ascension pipe 8 inches above the top of the mouthpiece, these particles were arrested and prevented from impinging on the bulb, the highest temperature recorded was 177° Fahr., reached 12 minutes after charging.

In its bearing on choked ascension pipes, the point I wish to consider, however, is not the actual temperature of the gas (about which it seems to me there is reasonable ground for some divergence of opinion), but what relation the temperatures inside the ascension pipes have to stopped pipes, and what are the causes of the great variation in temperature of different pipes.

All the temperatures recorded on Diagrams Nos. 1 and 2 were taken from pipes which had never during the previous two years given the slightest trouble. They may, therefore, be taken as indicative of conditions of temperature satisfactory so far as stopped pipes are concerned. On the diagrams which follow, temperatures, taken 12 inches above the mouthpiece, are indicated on the curves of temperature taken at the bridge-pipes by figures in positions corresponding to the time when taken. There does not seem to be any regular relationship between the two

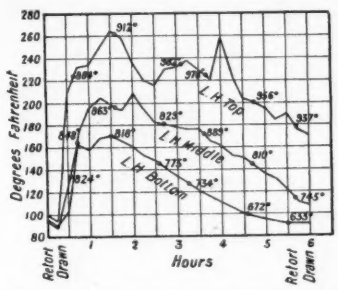


Diagram No. 2—Bridge and Ascension Pipe Temperatures.

sets of temperatures; the highest reading at the mouthpiece very often occuring some time after the maximum has been recorded at the bridge-pipe (see Diagram No. 2). The principal reason for the lack of uniformity in the two temperatures is, I think, due to the fact that, with the larger volume of gas coming off at the beginning of the charge, the ascension pipe cannot cool it uniformly enough to make any comparison of the temperatures at the mouthpiece and bridge-pipe possible.

A careful study of a considerable number of records has convinced me that, generally, the variation in the temperature at the bridge-pipe, under normal conditions, may be taken as indicative to some extent of the varying volume of gas passing. I will not, however, take up any more time with a discussion of side issues, but will proceed to Diagram No. 3, which demonstrates what I suggested as the primary cause of one form of stopped pipes.

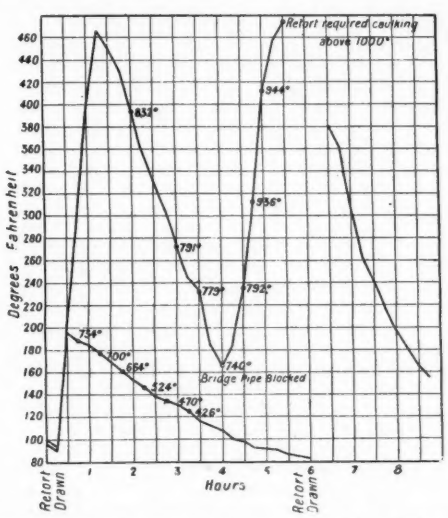


Diagram No. 3—Bridge and Ascension Pipe Temperatures.

The lower curve in this diagram shows what I may term the normal temperature in the bridge-pipe of one of our bottom retorts, and one which with ordinary attention has never given any trouble. The upper curve gives the temperature in the bridge-pipe of a similar retort which is in a leaky condition, and which, with monotonous regularity, makes-up every few shifts in the bridge-pipe only. The blockage takes the form previously referred to—of a dry, sooty deposit. The other five pipes in this bed give not the slightest trouble; and the fact that a sharp look-out for pitch has to be kept in this main is entirely due to the one bad pipe.

Soon after charging, the bridge-pipe temperature reached 465° Fahr., from which point for 2½ hours it gradually dropped to 165° Fahr.; and it was then found that the pipe was completely blocked. After the obstruction was removed, the temperature rapidly mounted again to 472° Fahr.; and then it commenced to fall. Temperatures taken just above the mouthpiece varied from 740° Fahr., when the pipe was blocked, to something above 1000° Fahr.—the temperature being beyond the range of the thermometer.

The last diagram of temperatures was obtained from a top retort, selected on account of the fact that it had not given the slightest trouble during the twelve months it had been at work.

The seal was reduced from ½ inch to ⅛ inch, and the pull unaltered. The third condition suggested by me was obtained—*i.e.*, excessive pull. Had the pull been adjusted to the lighter seal, no trouble would have resulted.

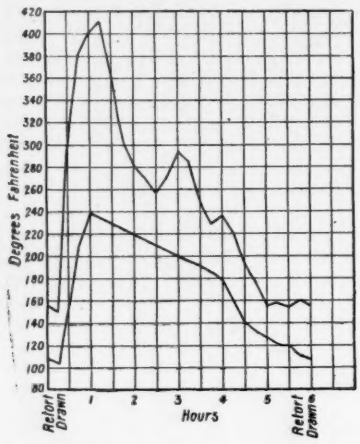


Diagram No. 4—Bridge-Pipe Temperatures.

The change in the temperature of the bridge-pipe is shown on Diagram No. 4; the lower curve being a record before and the upper one after the alteration. This bridge-pipe blocked up in less than 24 hours. The block was not, however, of quite the same character as the one just referred to. On taking off the cap (the pipe blocked about five hours after being charged), the top half of the pipe was found to be made-up with a deposit of half tar and half soot, which could be easily removed; while the bottom half was solid pitch. This was left until 1½ hours after the retort had been recharged. As was expected, it was then found to be in a softer condition, and easily dealt with.

When conducting the last experiment, a rather interesting observation was made (by means of a window in the side of the main) of the conditions in the main. About an hour after charging, there was some ¾ inch of the sooty deposit floating on the top of the liquor. The agitation of the liquor washed it against the glass; and it became covered above the liquor level with particles of fine carbon. In the course of another quarter of an hour, the glass began to clear; and it was seen that the carbon was gradually becoming absorbed by light oils, which were condensing on the top of the liquor. In a very short time, there were no particles of carbon to be seen and about ½ inch of light tar was floating on the liquor. This tar gradually began to form into globules about the size of a walnut, and then assumed a pear shape; the thin end gradually sinking, and from time to time breaking away and dropping to the bottom of the main. Two hours after charging, it had all disappeared in this way.

I am sorry that time and opportunity have been lacking to carry these investigations (they are still proceeding) as far as I should have liked, and as is necessary to arrive at any definite conclusions as to what constitutes the critical temperature in our case. It is evident I think from Diagram No. 4 that it lies somewhere between the two ranges of temperature shown. The records I have shown prove I think the suggestions that leaky retorts and excessive pull are responsible for stopped pipes in a greater degree than the high necessary temperature of carbonization.

I have not, unfortunately, had time to carry out any conclusive tests which would prove my suggestion that excessive retort temperature (let me repeat once more), not the high temperature necessary for carbonization, causes stopped pipes. I could bring several instances in my own experience in support, but will content myself with relating the experiences of Mr. W. Carr, as stated in a paper he read before the Incorporated Gas Institute in 1899. He had just installed regenerative settings of the Klönne design; and he said: "Up to this time I had held the opinion that the retorts could not be made too hot for the proper distillation of coal for gas-making purposes; but a new light was destined to break upon me. I gave these furnaces their head. 'Get them hot and see what they can do' was my instruction to the workmen . . . . The trouble we had with the ascension pipes was a revelation. I was reminded of it the other day when a neighbour of mine told me that he had in his works twelve men per shift working in the retort-house—four of them stokers, the rest pipe cleaners."

In connection with the vacuum and pressure charts I have, I must say that a vital point in successful carbonization is that the conditions of pressure in the retort should be as near level gauge as possible. Any material deviation from this will result in one of two evils. Either there will be a leakage of coal gas through the retorts into the setting and "hydrocarbon degradation" or furnace gases will be drawn into the retorts. The rapid evolution of the gas in a freshly-charged retort is capable of considerably increasing the pressure during the earlier periods of carbonization. By working at a slight vacuum in the retort—say, 1-10th to 2-10ths during this period—a minimum amount of coal gas is lost. When the evolution of gas begins to ease-off, the 2-10ths pull is not exceeded; and from this time to the end of the charge some furnace gas will no doubt be drawn in if there is a pressure in the setting. This, however, is not always so in our case.

Owing to circumstances over which we have no control, the producer fires have to be cleaned every eight hours, and towards the end of this time part of the setting is under vacuum and part under pressure. Therefore, unless a retort is in a very leaky condition, no great amount of furnace gas is drawn in. It is not, of course, advisable to reduce the pull at the end of the charge, as other retorts are to be recharged, during the six hours the charge we have under consideration is burning off, and are, in turn, evolving gas at a rate necessitating the pull required to take it away with the least loss. Under these conditions, it seems to me that it is the better course not to lose the coal gas but to risk drawing in the furnace gas; so long as the gas obtained is kept at the standard of quality it is desired to produce.

In gas manufacture, as in every-day life, the maxim of the minority having to give way for the good of the majority holds; and we have found that, so long as the conditions are carefully watched, and troublesome pipes attended to without delay, the results obtained justify our methods.

I should like to add a few words on the question of oscillation produced in hydraulic mains by the use of the hydraulic seal. Diagram No. 1 shows the vacuum on the hydraulic, and at the discharging mouthpiece of a top retort under our usual working conditions. The dip-pipe had ½-inch seal, and there was an average pull on the hydraulic of 6-10ths. With two exceptions in each shift, the conditions in the retort show a fairly constant average pull of 1-10th. The exceptions or occasions when the normal conditions in the retort were disturbed, were clearly traced to two distinct causes. (1) The insertion of a new charge, when for about 10 minutes the pressure was increased some 4-10ths. (2) When the main was being cleared from tar and afterwards flushed with liquor. In the second case, there was a temporary increase of vacuum to 6-10ths, quickly followed by a pressure of a few tenths as the ingoing liquor exceeded the working level.

The desirability of working with a light seal and properly adjusted pull is illustrated by reference to the Diagram No. 2. This record was taken when we were experimenting to obtain the most satisfactory results in the retort; and the different conditions shown are due entirely to alterations made to the seal while the records were being taken.

The results shown on the charts emphasize, I think, the necessity for careful regulation of the seal and pull, and show what can be done in the direction of maintaining fairly uniform conditions without the assistance of anti-dips or retort-house governors. Retort-house governors, in conjunction with hydraulic mains, suggest themselves to me as an unnecessary refinement—at all events, in works where there is an attendant constantly present in the exhauster-house. In cases where proper and responsible attention cannot be given to the exhauster, and a record of the pull is not kept, they are without doubt of great advantage.

Discussion.

The PRESIDENT voiced the members' gratitude for Mr. Cawthra's kindness in filling the breach in their programme, and congratulated him on the interest, novelty, and value of the investigations he had begun. The subject was one of their inevitable troubles, even if fortunately only of occasional occurrence; and anything that would throw light on the origin of these troubles would help in their prevention. Personally, he attached much blame to small and dusty coal, the use of which, especially under some conditions of retorts and of machines, was certainly likely to lead to mischief. He had also found another fruitful cause to be the failure to run the charge of inclined retorts well down to the stopper plate.

Mr. C. TOWNSEND agreed that a light seal, combined with a small pull, gave far more regular and even pressures than heavier seals, even with an equivalently greater pull. At his works, their custom was to test working conditions by affixing a pressure gauge to each arch pipe in turn; and it was interesting to note the differences in pressure on the same bed at the beginning and end of carbonizing periods when working with light seals and small pulls compared with heavy seals and greater pulls. They tried to let the retorts range between 2-10ths pull and 1-10th pressure. Their settings and retorts corresponded very nearly with those Mr. Cawthra had been referring to, except that they employed Dillamore tar-towers—three beds to a column. He agreed with the need of readjusting each dip at least once a year. Even then the buckstays gave with heat, so as to again soon produce variations in the seals. He had a long experience with retort-house governors, and liked them well. Under some conditions, they were essential. They had nine beds that worked best with a light seal and small pull, others that worked better with more seal and pull; and separate governors enabled them to work both to the best advantage. Again, having in an emergency to fall back on some old horizontals whose hydraulic main was very uneven, by the aid of a governor they were able to surmount their difficulties—keeping the dips practically unsealed with a level gauge in the hydraulic main. If a tar-extractor was interposed before the exhauster, a retort-house governor was even more imperatively called for to ensure even working.

Mr. J. H. HILL said he had had some puzzling instances of stopped pipes; and his interrogation of the culprits had not always obtained satisfactory answers. At least in some cases his idea was that the trouble was due to a too high temperature in the ascension pipe, coupled with a too low one. Some that persistently blocked up were opposite and near to doorways; and

covering these, and thus shielding them from winds, certainly brought about a great improvement, though he would not yet say how far this improvement was permanent. Still, it went without saying that if the lower part of the pipe was too hot and the upper part too cool, there would be excessive condensation at the top, and the resultant deposited tar would become calcined lower down. His own custom was to maintain from 3-10ths to 5-10ths pull; and he used no retort-house governors. He employed a special arrangement of tar take-off, which many of the members had had an opportunity of inspecting; and this maintained ½-inch liquor seal. His direct-fired settings gave little trouble with ascension pipes, partly owing to the lower heats obtained and partly because they were in a larger house and less exposed to draughts. His worst experiences had been with a set of shallow regenerators, where great variations in heats occurred, bringing in their train irregular working and many pipe troubles. The replacement of these by better and deeper regenerators brought about a great easing of their troubles.

Mr. LANG was somewhat surprised at Mr. Hill's "overcoat" arrangement for his ascension pipes, as he had always believed in keeping them as cool as possible. He had to contend with "bull's eyes," and found these stopped twenty times to once on the part of others, and needed a thorough cleaning out two or three times a week. This might be attributed to the unavoidably excessive heat in these retorts, and to the fact that their ascension pipes passed two other mouthpieces. Though leakiness of retorts was sure to bring on pipe troubles, the "bull's eyes" were always the worst. A common device with knowing stokers was, if permitted, to let the coal come well down into the mouthpiece, and even to put a shovelful of wet coal there, especially when the auger could only just find its way through; then in an hour or two's time they could more easily clear the pipe.

The PRESIDENT said he had but rarely cases of stopped pipes in his regular working, but could confirm Mr. Hill's experience that strong winds in directions that enabled them to blow directly upon the front of their inclined settings resulted in a crop of stoppages, until they inserted temporary shields in the window spaces. He wondered if, even with running off the tar every eight hours, Mr. Cawthra would not have stiff pitch to remove when he set down and cleaned out.

Mr. COOPER had had a recent experience that confirmed both Mr. Hill's and Mr. Cawthra's contentions, inasmuch as the end pipes of a hydraulic main which worked well at first, gradually got a lessened seal as that end of the main rose. This involved an extra pull on the retorts, and led to the pipes becoming stopped. They happened also to be the ones most exposed to draughts; and this doubtless accelerated the appearance of troubles.

Mr. BOOTH congratulated Mr. Cawthra on the start he had made with what should develop into an extremely interesting research, only it called for more details than had that day been given, before sure conclusions could be deduced. It would be interesting to try to measure the heat lost from the mouthpiece and from the ascension pipe, and so get at the temperature of the retort gas. One might then see if the rise noted was due to coal gas or furnace gas. In his more recent experiences, he had had plenty of strong direct wind currents blowing through a retort-house; but, unlike previous speakers, he had not found stopped pipes caused thereby. He had, however, found that they had caused mouthpieces to pitch fast, and had had men injured in violently pulling them open. The most draughty house he had to deal with was, singularly, free from pipe troubles, except in one case; and there, ultimately, he found a great crack in the dip-pipe —thus confirming Mr. Cawthra's conclusions about excessive pull as a chief contributory cause of stopped pipes. His other cases had been mainly attributable to leaky retorts and light charges at the bottom end of inclined retorts.

Mr. CAWTHRA, in replying to the discussion and to sundry questions put by members, emphasized that what he meant by excessive temperature was simply one greater than was needed to completely carbonize the charge in the time allowed. He would commit himself to no figure as being too high a temperature—it depended on the character of the coal, the weight of the charge, and the time allowed for it to "burn off." Fine coal, if dry, did accentuate pipe troubles; the dust clinging to the deposited tar. As regards Mr. Scholefield's inquiry as to whether stiff pitch did not need removing when a main was set down, even with eight hours running off of tar, he agreed that it was so, and pointed to such masses among his specimens on the table, but explained that it was more or less fluid when gas making stopped, and solidified on cooling. He emphatically endorsed the need of the levelling-up of hydraulic mains whenever the bench was set down. Modern practice supported the main from the buckstays and not directly from the brickwork. This was good, but not absolutely effective, as seals would often get ½ inch out at one end. Much of the trouble was due to the expansion of the ascension pipes, which tended to lift the hydraulic main bodily off the supports. They had found this happen, and had carried out remedial measures while the bench was still under full fire. They had broken joint, wedged the main up, and then made good the joint. Trouble arising from thin layers at the bottom of the inclined retorts, or coal creeping and leaving thin or bare parts, exactly coincided with his contention as to the result of excessive heats—heat was being applied to those parts in large excess of the work presented to it. The same applied to the cases quoted of "bull's eyes"—their heats were excessive unless heavier charges or shorter carbonization periods were allowed to them than to the other retorts He hoped the visitors would not imagine that they were at this works plagued with stopped pipes. Those that did occur were mainly towards the end of the working life of the retorts concerned. They had many that had done from 1000 to 1300 days' work, and they were yet going to use them for another twelve months. He thought Mr. Hill's "overcoating" of his pipes was hardly on right lines; and it was noticeable that their best pipes were often in the worst positions as regards draughts. The reference in his paper to Mr. Newbigging's investigations of retort gas temperatures was taken from the fifth edition of the "Handbook;" and, since his paper had been set up in type, his attention had been called to the fact that in the latest edition the author had incorporated a communication from Mr. Sheard, pointing out that, even calculating from the figures already quoted, the temperature of the gas in the retort would certainly be higher than that first suggested. He agreed with a previous speaker that Mr. Newbigging's insertion of sheets of gauze would probably be producing a stopped pipe; and, as his third diagram showed, this would be accompanied by a greatly falling temperature.

[Mr. Cawthra then exhibited and explained the contrivance used by him for ascertaining the dip on his pipes, and some other members contributed their methods also.]

A cordial vote of thanks was passed on the proposition of Mr. A. EDWARDS, seconded by Mr. ATLEY.

INSPECTION OF THE HALIFAX GAS-WORKS.

At the close of the meeting, the members were conducted round the Halifax Gas-Works. Their many special features and points of interest were examined with considerable thoroughness; special attention being given to what was a novelty to most of the visitors —viz., the recently installed plant for recovering the cyanogen of the gas, and working it up into crystals of yellow prussiate of soda by the Davis-Neill process.

EXTRACTING TAR AND AMMONIA FROM GAS.

A patent has been taken out for France by Herr Wilhelm Müller for a process and plant for directly obtaining oil, tar, and sulphate of ammonia from the gas resulting from the distillation of coal or other material. The inventor's object has been the production of simpler and more economical apparatus, the employment of the smallest possible amount of motive power in connection with it, and the direct extraction of tar and ammonia in a perfectly pure state without the employment of steam or lime. The following is a translation of the principal portions of the specification.

The plant is shown in the diagrams on p. 234—fig. 1 being a vertical section of the entire apparatus; fig. 2, the condenser and washer; fig. 3, a section and plan of the saturator; and fig. 4, another form of it. The condenser and washer, shown in detail in fig. 2, consists of an outer case of sheet iron enclosing another. The outer compartment A acts as a preliminary condenser, and the inner one B as a washer or purifier. The latter is furnished with hurdle grids, which cause close contact between the ascending gases and the descending purifying agent. In the upper part of the plant are horizontal and vertical sieves, through which the gas has to pass in order to remove any particles of dust. There are also several nozzles or injectors (see fig. 2), which discharge into both compartments gas liquor, oil, or other liquid suitable for the purification of gas. Towards the bottom of the inner compartment there is a flanged wheel C, driven from the outside by a motor, as shown in fig. 1. The object of this wheel is to increase the speed of the gases upwards. The gas enters the vessel by two pipes—the upper one D communicating with the outer compartment, and the other E with the inner one. The positions of the pipes for the admission of the gas were chosen with the view of preventing any condensation of tar in the lower portion of the apparatus. Accordingly, the gas rich in tar which comes off in the first three-quarters of the period of carbonization is collected separately in the retort-setting, is introduced into the washer at the top, and passes right through; whereas the rest is sent through the middle of the apparatus, and overheating is avoided. It mixes with the half-washed gases, is washed or purified in the upper part of the plant, and passes out by the pipe F. The grids with which the washer is filled are so shaped and arranged that all their surfaces are kept thoroughly wet by the trickling and the continuous spraying of the purifying liquid. They are usually made of wood; but they may be formed of stone or iron. They do not require changing for the purpose of cleaning, as they are continually washed by water and the hot gases.

Connected with the washer by the pipe G is an ammonia saturator, shown at H in fig. 1, and on a larger scale, in sectional elevation and plan, in fig. 3. The gas enters by the pipe I, which is widened out at the lower part, as shown in fig. 3, or ends in several descending pipes J, as in fig. 4. There is another pipe K for carrying off the gas. It will be seen that the cover of the saturator is furnished with several grooved or toothed plates or boards, dipping obliquely forwards and transversely into the liquid. They are so attached to the cover as to be able to rotate upon it; and the extent of their immersion can be regulated from the outside. At the side of the saturator is a scum chamber L, the inner surface of which is concave; and below are sieves M for

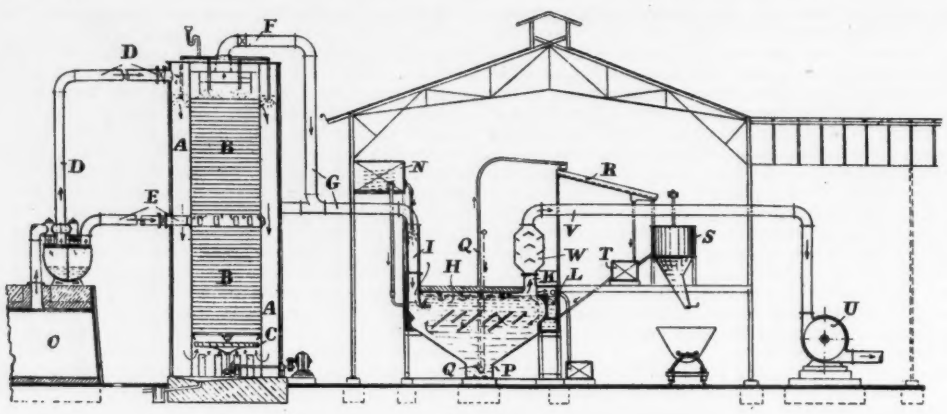


Fig 1.

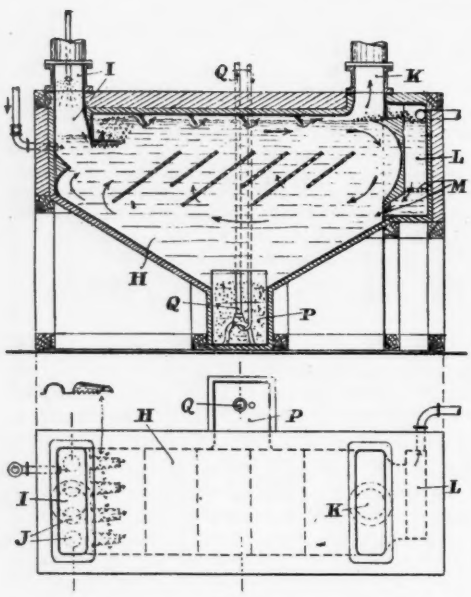


Fig. 3.

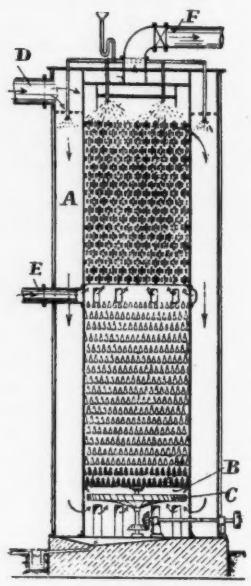


Fig. 2.

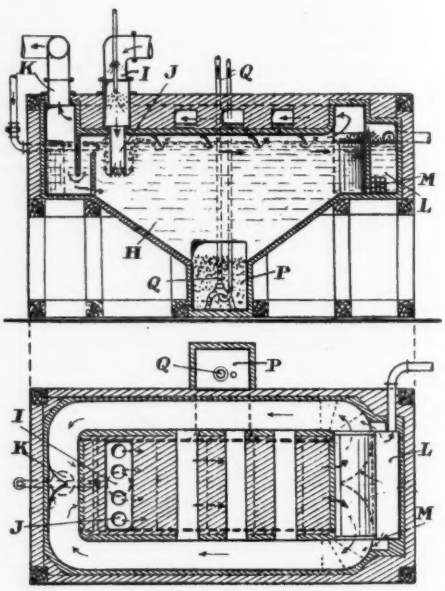


Fig. 4.

removing the tar or other matter floating upon the surface of the liquor, and sending it through a discharge-pipe. In the middle of the saturator are perforated baffles, mounted obliquely, as in fig. 3, and running transversely, to catch and retain the salts entrained in the circuit of the liquid. The saturator is constructed by preference as shown in fig. 3.

The saturator is filled with a solution of dilute sulphuric acid (35° to 40° Beaumé), with a percentage of free acid, preferably until the liquid just touches the cover—a height which is kept constant by conveying fresh acid from the tank N (fig. 1) through a regulatable pipe. Then there is another pipe to inject fresh sulphuric acid, by the aid of a nozzle or injector, into the pipe I, and spray it in the current of gas; absorption of ammonia in the saturator being thus facilitated and accelerated. To increase the "heat of reaction" in the saturator, this newly introduced sulphuric acid is previously heated with a steam worm or other similar device in the tank N, and thus conveyed, well heated, into the liquid. With the same object, the walls of the saturator are provided with steam-pipes. The gas exit-pipe K is connected with an aspirator of ordinary type, which draws the gases to be washed through the plant, and drives them into the furnaces or a holder. The plant is preferably constructed in the immediate vicinity of the gas-producing plant; and the communication pipes between the two plants are coated with insulating material.

The process of treating the gas is as follows: The hot gas is first freed from tar and other foreign matter, so as not to contaminate the sulphate of ammonia, and render it useless, when the gas subsequently passes through the sulphuric acid bath in the saturator. For this reason, the hot gases from the retort-setting O (fig. 1), which are cooled to a certain extent in the hydraulic main, are conveyed into the apparatus at about 250° C. to 300° C. They then usually enter by the pipe D into the outer compartment of the washer, pass through the inner compartment, and descend through openings under the flanged wheel C into the washing chamber. During the stay of the gases in the outer compartment, they are cooled to about 100° C.; the main portion of the tar, dust, and other foreign substances being separated. In order to remove the finest particles of dust, tar, and oil from the gases, they are conveyed into the washing chamber, and (passing over the grids already referred to) are compelled to separate into fine currents, and distribute themselves uniformly all over the chamber. Owing to the great velocity produced by the wheel C, the gases always rebound against the lower horizontal surfaces of the grids; the solid constituents and the dripping liquid having to remain, while the resulting product of condensation serves at the same time as a washing agent for the ascending gases. On the other hand, the grids being bathed from above and washing all the surfaces, the gases both rebound and come into close contact with the washing or purifying material trickling downwards and the damp surfaces of the grids. The purified gas passes through the sieves placed at the upper part of the washer (with the object of removing the last traces of water), and escapes through the pipe F, by which it is conveyed directly to the saturator.

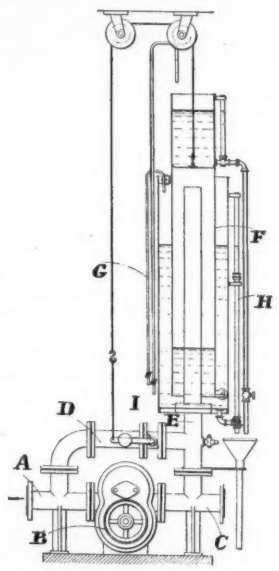
The fixed sulphate of ammonia formed in the saturator is deposited in the lower collector P, which empties into a side pipe; and the sulphate is raised in the usual way by an injector Q and steam to a platform or gutter R, whence it is conveyed into the centrifugal machine S, and afterwards, in a condition ready for sale, to the store. The separated liquor runs into a tank T, to be returned to the saturator. The gas, freed from tar and ammonia, is drawn from the saturator by an aspirator U (fig. 1) through the pipe V, after passing through an acid separator W. Thence it is pumped into a gasholder, to be used for purposes of lighting, heating, and motive power.

Annual Meeting of Austrian Gas and Water Engineers.—The "Zeitschrift" of the Association of Gas and Water Engineers of Austria-Hungary announces that the thirtieth annual general meeting of the Association will be held at Brünn from Thursday, the 25th, to Sunday, the 28th prox. An exhibition of gas apparatus will be held in connection with the meeting. The programme of technical papers and subjects for debate will be issued later.

Wales and Monmouthshire Institution of Gas Engineers and Managers.—We learn from the Secretary (Mr. Octavius Thomas, of Pentre) that the next meeting of the Institution will be held at the Bargoed Gas-Works on the 3rd prox., under the presidency of Mr. J. H. Canning. The business will include the further discussion of Mr. Thomas Canning's paper on "The Thermal and Thermo-Dynamic Efficiency of Town Gas in Practice," read at the meeting in September last, and given in the "JOURNAL" for Oct. 4 (p. 42), and the election of officers for the ensuing year. At the close of the meeting, the members will visit the Powell Duffryn Coal Company's coke-ovens and bye-product plant.

REGULATOR FOR HIGH-PRESSURE GAS-MAINS.

A patent has been taken out for France by MM. Angst and Flocon for an appliance for regulating the pressure of gas in mains supplied by means of an aspirator. It is shown in the accompanying diagram.



The gas feed-pipe A ends in an aspirator or blower B, of the Roots or any suitable type, which drives the gas into the outlet-pipe C, through which it passes into the mains. The two pipes are connected by a bye-pass D, so as to allow of the return to the feed-pipe of a portion of the gas sent by the blower into the outlet-pipe, which communicates by the pipe E with a gasholder having a movable bell F. The tank is filled with water by means of the pipe G; the quantity being regulated by the tap at the bottom. A water-level H records the height of the water in it. A rope is fixed to the bell F, and passes over pulleys; its end being secured to the lever of the cock I. Above the bell there is a cistern, which can be filled with water by the pipe shown; the height being indicated outside.

The action of the regulator is as follows: The quantity of gas which returns into the pipe A depends on the amount of passage given by the cock I, by which the bell F is governed. The interior of the bell, connected by the pipe E with the outlet-pipe C, is always under the same pressure as this pipe. Greater or less pressure is obtained by running more or less water into the cistern at the top; the quantity being regulatable by the cocks shown. When once equilibrium has been established, the regulator maintains automatically the same degree of pressure on the gas issuing from the blower. Should the gas consumption fall off, the pressure in the pipe C increases. The bell rises, the lever of the cock I falls under the action of the counterweight, and the passage is enlarged. The quantity of gas returning to the pipe A through the bye-pass increases; and this tends to bring to the normal the pressure in the pipe C. When, on the other hand, the pressure falls, owing to greater consumption, the bell drops, actuates the lever, and reduces the size of the passage way of the cock I.

The advantage claimed for the appliance is that pressure can be quickly and accurately regulated by keeping the required quantity of water in the cistern above the bell of the gasholder; and this can be done by simply turning the taps governing the admission and discharge of the water.

SIMPLE FORM OF CONDENSING PLANT.

There has recently been published the specification of a patent taken out by the Paris Gas Company for a simple arrangement of condensing plant, occupying small space, and ensuring, as the inventors claim, the complete separation from the gas of the ammonia and all but about 1 per cent. of the tar. It can be made to deal with the production of an entire bench of retorts or of half a bench; and in small works it should be adequate to deal with the gas during the period of maximum production.

The plant is shown in the accompanying illustrations—fig. 1 being the condenser; fig. 2 the device for regulating the slits in the impact portion (to be described later); and fig. 3 a transverse section on the line XX of fig. 2.

The condenser consists of a cooling chamber in the upper part, into which the gas enters by the pipe shown, and passes downwards. This chamber is furnished with a suitable device for the circulation of water; and, as shown in fig. 1, it consists of several vertical tubes in which a current of water ascends, and around which plays the descending stream of gas. The water runs into the tank at the bottom of the cooling chamber. In this chamber, as will be seen, there are horizontal sheet-iron perforated plates, the object of which is to break up the stream of gas, keep it in contact with the cooled metal, and delay the precipitation of the condensed liquid in order to ensure its cooling as well as that of the gas. The outlet-pipe for the gas leads, as shown on the right-hand side of fig. 1, into the upper part of the impact chamber, which consists of a receptacle divided into two compartments by an iron plate placed at an angle, and ending in a vertical piece which does not quite reach the bottom. The sloping partition has in it a certain number of slits, as shown in fig. 2; and it can be closed with the rod passing through the casing of the receptacle.

Fig. 1.

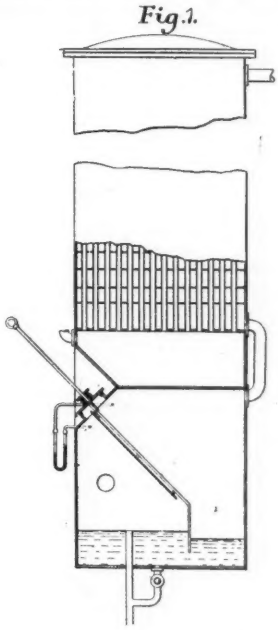


Fig. 2.

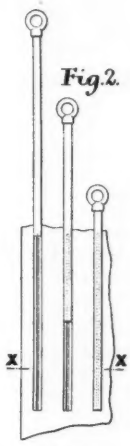


Fig. 3.

Under each slit is a rod, half-cylindrical in section, kept at a short distance from the slit by iron fastenings. The gas issues from the receptacle through the opening shown. The tar accumulates at the bottom, and flows away through the pipe carrying away the products of condensation—a side pipe, usually closed with a plug, being utilized when necessary to discharge the whole of the tar. The plant is completed by a differential pressure-gauge, the two branches of which are connected with the two compartments of the receptacle.

The action of the plant is as follows: The gas, after being completely cooled in the top portion of the condenser, passes into the upper compartment of the partitioned receptacle. Several of the rods are then placed in such a position as to open the corresponding slits, whereupon the gas passes through and impinges on the rods opposite to them. Owing to the impact, the tarry particles accumulate upon the rods, and fall to the bottom of the receptacle. The advantage claimed for the appliance is that it is simple in construction, and assures very effective condensation with only a slight fall of pressure.

A RAPID METHOD FOR ESTIMATING SULPHUR OR AMMONIUM SULPHATE IN COAL GAS.

By H. Blair.

[A Paper read before the Newcastle Section of the Society of Chemical Industry.]

Ammonia can be determined with rapidity and accuracy by making use of the well-known reaction of Malfatti—the formation of hexamethylenetetramine and liberation of acid by treating a solution of an ammonium compound with formaldehyde. The reaction proceeds quantitatively, according to the equation:

$$4NH_4Cl+6CH_2O = N_4(CH_2)_6+4HCl+6H_2O$$

and the acid liberated can be titrated with standard alkali, using phenolphthalein as an indicator.

Determination of Sulphur in Coal Gas.

The liquor obtained in the Referees' test is made up to 500 c.c., and 50 c.c. boiled for two or three minutes to get rid of carbon dioxide. To the hot solution, 10 c.c. of a neutral formaldehyde solution (of about 30 per cent. strength) are added; and the solution is at once titrated with $N/10$ caustic potash solution. 1 c.c. of this solution corresponds to 0·0247 grain of sulphur.

It is well to standardize the potash solution by means of a standard solution of ammonium sulphate containing a little ammonium carbonate.

The following figures show that the method gives concordant results; and although the determinations by barium sulphate

are a little lower, the discrepancy is too small to be of any real importance.

Sulphur in Grains per 100 Cubic Feet.

Sample.	By Barium Sulphate.	By Rapid Method.
i.	4·53	4·923 5·211 } Mean 5·064 5·058
ii.	10·19	10·89 10·89 } Mean 10·89 10·665 11·115
*iii.	32·81	33·97 33·97 } Mean 33·97
*iv.	24·98	24·80 25·29 } Mean 25·04
*v. } Redheugh	27·46	27·72*
*vi. } Redheugh	21·02	22·12*
*vii. } Redheugh	21·12	21·63*
*viii. Elswick	4·80	5·30*

* Figures furnished by Mr. G. Weyman.

As the volume of potash used is considerable, the method can be utilized for the determination of sulphur in a smaller volume (1 or 2 cubic feet) of gas, and the whole operation be completed in an hour. It is only necessary to burn a measured volume of the gas under a glass adapter; and by means of a water pump draw the products of combustion through a solution of ammonium carbonate, which is then treated with formaldehyde as already described.

Determination of Ammonium Sulphate.

The ammonium sulphate is dissolved in water, and, as it is always acid, neutralized with standard caustic potash. An aliquot portion is then boiled for a few minutes; 10 c.c. of neutral formaldehyde solution added; and the liquid allowed to boil for a few seconds. Phenolphthalein is now added, and the hot solution titrated with $N/10$ caustic potash, of which 1 c.c. = 0·0049 H_2SO_4, 0·017 NH_3, 0·0066 $(NH_4)_2SO_4$.

Ammonia per Cent.

Rapid Method.	Barium Sulphate Method.
*1. 25·65	25·64
2. 25·14	25·16
3. 24·95	24·92
4. 24·78	24·77
5. 25·18	25·16

* This series made by Mr. G. Weyman.

CONSERVANCY OF WATER.

Before the Society of Engineers a paper on the "Administrative Aspect of Water Conservancy" has been read by Mr. W. R. Baldwin-Wiseman, Assoc.M.Inst.C.E. The paper was illustrated with numerous tables and a map.

In introducing the subject, the author pointed out that during a period of more than forty years there had been a steady output of papers, articles, and reports of Royal Commissions and Select Committees of one or both Houses of Parliament, all urging the development of some system of conservancy of water and the creation of a number of local authorities, acting under the direction of a central authority. But the subject did not appear to have received that attention from Parliament which its importance merited, and which the weightiness of several of its recommendations should have ensured for it—doubtless because, as the author pointed out, the question was too complex and technical to appeal to the general public. Even among those who recognized the necessity of doing something, there was a fear that any alteration in the existing order of things might lead to increased taxation—little thinking that the cost of a dispute under the continuance of the existing condition of things far outweighed any possible expenditure on systematization; while others found themselves unable to draft a scheme which, while being comprehensive and efficient, should not be too costly.

The author urged that no general scheme should be engaged in until systematic data had been collected by a special hydrographic survey staff; and when subsequently the local authorities were created to administer the several river basins, the authorizing Acts should be general, so that each Rivers Board, comprising all the varied interests of the basin, might be left with a fairly free hand to administer their area to its best advantage, having regard to its own peculiar interests.

Mr. Baldwin-Wiseman dealt in detail with the extreme divergence in the characteristics of river basins in point of size, geological structure, distribution of population, the number of local authorities, the rateable value, and the economic and industrial importance of each basin, and pointed out that the characteristics were so diverse that no truly efficient scheme could be formulated which was not sufficiently elastic to meet the varied conditions. He next reviewed various schemes for grouping river basins proposed by the Royal Commission on Rivers Pollution Prevention, and by Messrs. Ansted, De Rance, and himself, and gave tables showing the population, rateable value, and number of local authorities in each of the twelve groups of his own suggestion.

The author then attempted an estimation of the value of the public water interests in the country, and outlined an administrative system comprising a central authority controlled by a Minister of Water Supply, supervising twelve Main Drainage Boards, each in charge of an area comprising a group of basins, and Rivers Boards each in charge of a river basin. He showed that such proposals were by no means revolutionary, and need not develop into anything more bureaucratic than the existing system of local authorities responsible to the Local Government Board. But he suggested, as a preliminary step, that a survey staff should be at once organized to collect the necessary data, upon which Parliament might deliberate when it took in hand the creation of the new administrative system. He pointed out, from reference to similar organizations in other countries, that the cost of maintaining such a body need not be excessive; and he suggested that such funds as were required in the first instance might be obtained by the Local Government Board from the Development Fund.

In the course of the discussion on the paper, Mr. Easton Devonshire expressed the opinion that the scheme to be formulated should be on the lines of a central organization under the Local Government Board, who would have *quasi*-judicial powers for the protection of the national water supplies all over the country. He would not have the central authority represented by the district or river boards suggested by the author, but would allow it to appoint its own agents, whose duty it would be to supply the central authority with records of the flow and level of both surface and underground water. The central authority would thus be in a position to advise Parliament in the case of Water Bills, and the Local Government Board in that of local applications to that body. Mr. Percy Griffith agreed generally with the views expressed by Mr. Devonshire. Mr. W. Whitaker, F.R.S., pointed out that in a scheme of the kind suggested by the author, private as well as public water supplies must be taken into account. Mr. E. J. Silcock thought that the scheme would entail too much supervision; while Dr. Rideal considered the matter was one which could best be dealt with by lawyers. Mr. R. O. Wynne-Roberts was opposed to the multiplication of authorities. Mr. Baldwin-Wiseman, in reply, defended his scheme of river boards, on the ground that the local committees would be able to effect compromises, which would facilitate and cheapen the passing of Bills through Parliament.

Patents in the United States.—The annual statement of the United States Commissioner of Patents shows that 35,778 patents were issued last year, and that out of this total 3719 were granted to natives of foreign countries. The latter figure comprises: Germany, 1083; Great Britain, 973 (or England, 894; Scotland, 67; and Ireland, 12); Canada, 534; France, 315; Austria-Hungary, 139; and Sweden, 124.

Protection of Water Supplies.—This subject will be dealt with by Mr. H. C. H. Shenton, the Vice-President of the Society of Engineers, in a paper to come before the members at their meeting next Monday. In the course of it, the author will deal with the conflicting opinions prevailing as to standards of purification and as to the pollution of water, and emphasize the value of protective works. He will show that engineers are capable of meeting the severest demands of scientists, and will advise acquiescence in the adaptation of purification standards in order to meet conditions condemned.

Ozonized Water for St. Petersburg.—According to the "Zeitschrift für Electrochemie," as quoted by the "Chemical Trade Journal," the Government of St. Petersburg have installed a fair-sized plant for the sterilization of Neva water by means of ozone, so as to fit it for drinking purposes. The station can deliver more than 10 million gallons daily, and is the largest example of the ozone process. The water is first clarified by means of aluminum sulphate, then sent through quick filters, and finally passed to the sterilizing towers, in which it is intimately mixed with the ozonized air by means of Otto injectors. For the production of the necessary ozone, 128 Siemens machines have been installed; and the plant includes three 150 H.P. dynamos. Neva water, which has a sinister reputation and even an evil appearance, is said to be rendered a wholesome drinking water by the process.

Determination of Free Carbon in Tar.—This subject was dealt with by Sig. Ceruti in a recent number of "L'Industria Chimica." According to an abstract of his article in the "Journal of the Society of Chemical Industry," the process is as follows: Ten grammes of the tar are weighed into a beaker of 200 c.c. capacity and heated for two hours to 110° C. in an oven; 150 grammes of castor oil, previously heated to 120° C., are then added, and after a further two hours the mixture is poured, a little at a time, on to a weighed filter mounted inside the oven. The residue on the filter is washed with hot castor oil, and then, after removing the filter from the oven and cooling, the washing is completed with alcohol and carbon tetrachloride, and the filter and residue are weighed. The residue thus obtained, apart from inorganic matter, contains about 95 per cent. of carbon, and consists mainly of finely-divided carbon similar to lampblack; but it also contains a small proportion (not more than 2 per cent. of the weight of the tar) of coarser graphitic carbon,

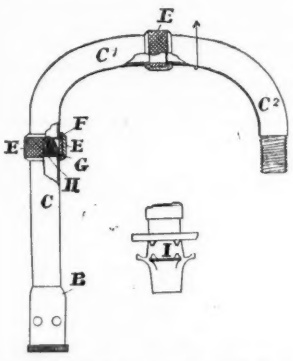
REGISTER OF PATENTS.

Incandescence Gas-Burners and Fittings.

CHALLIS, J., of Hampstead, and STEPHENS, K., of Manor Park, Essex.

No. 4989; Feb. 28, 1910.

This incandescence gas-burner has a mixing-tube formed of sections adapted to be adjusted so as to take different angular positions, and in which are fitted diaphragms of gauze for obviating lighting-back; the object of the invention being to provide of greater flexiblility and a reversible burner for upright as well as inverted positions without removal or alteration of any of the parts.



Challis and Stephens' Convertible Incandescent Fitting.

The illustration shows an external view of the reversible burner-nozzle and mantle-holder; also an elevation (partly in section) of the tube made of three sections, one of which comprises a bunsen air-chamber, while the outer one is arranged for the reception of the burner-nozzle and mantle-holder.

Holes admit air in the usual manner to the gas in the chamber B, and the mixture passes through the gauze in the sections C, C^1, C^2, to the burner-nozzle I, which can be screwed on to the end of the section C^2. A sleeve-nut E, secured over the flange F in conjunction with a screwed portion G, serves for securing adjacent sections together. The gauze H prevents back-lighting.

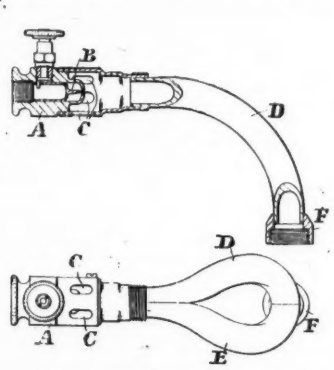
This arrangement of three sections provides for the adjustment of the burner in any position; and in order to enable the mantle to be turned with the burner, the nozzle I is formed with lateral projection bearing claws or studs, and with a ring having corresponding claws or studs. The ring is suitably distanced from the projections, so as to permit of the introduction of the usual radial arms or prongs of the mantle ring without leaving undue endwise play. The effect of this combination is that no matter in what position the burner be placed the mantle will be securely held.

Gas-Burners.

ROBIN, J. I., of Cheapside, E.C.

No. 5469; March 4, 1910.

This invention relates to burners for use with incandescent gas-mantles, of the type in which the mixing-chamber is formed of tubes connected at their inlet ends, each at a sharp angle to the direction of the flow of gas through the inlet chamber; the tubes being also connected together at their outlet ends, each at an angle to the axis of the outlet chamber.



Robin's Incandescent Gas-Burner.

As shown, the end A of the burner, to which the main gas-pipe is attached with any usual form of gas-regulating valve B, is provided with the usual air-admission holes C, with opening controlled in any desired manner. A short distance beyond the air-admission ports the pipe is divided into two branches D E, inclined at an angle to one another, and arranged so that the dividing partition between them is very sharp, so as not to interfere with the passage of the gas mixture. The ends of the tubes remote from the admission end are connected to a piece of tubing, which forms the burner end, and from which the mantle is supported on a socket. The double mixing-chamber is connected to the burner-tube in such a manner that the gas mixture enters the latter in an inclined direction from each side, and leaves it without substantially altering its direction. In this way, the flame, instead of coming straight out of the burner-tube, impinging at one part on the mantle and then being bent back on itself, is said to be "short and bushy," and more nearly conforms to the shape of the mantle—thus "giving a much greater illuminating effect."

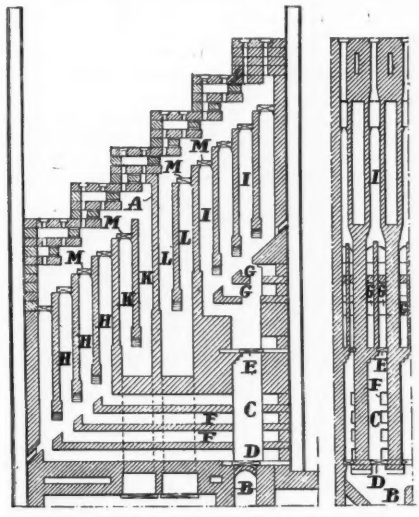
If desired, the burner-tube may be provided inside with a piece of gauze covering the delivery holes from the double mixing-chamber and serving to further break up the gas mixture.

Gas-Fired Coke-Ovens and the Like.

BENNINGHOFF, O., and KLÖNNE, A., of Dortmund, Germany.

No. 8174; April 5, 1910.

This invention relates to the heating of gas-fired ovens for the production of coke, but it may be also for the production of illuminating gas—of the type comprising obliquely arranged chambers and heating flues divided into two groups by a central partition wall. In an arrangement of this kind, the front group of flues should, as a rule, be more highly heated than the rear group, as the heating flues of the front group pass around the main portion of the interior of the oven, while the heating flues of the rear group are mainly intended for making good the loss of heat due to radiation. The object "aimed at is to ensure more uniform heating and to economize the consumption of combustible gas by arranging that the rear group of heating flues need be supplied only with gas sufficient for the first stage of distillation and for making good the loss due to radiation." Thus there are provided in connection with the gas supply passages distributing chambers that can be shut off and that supply gas to the heating flues of the lower group directly, and to the flues of the upper group by an adjustable damper.



Benninghoff and Klonne's Gas-Fired Furnaces.

By means of the partition wall A, the oblique chamber shown is divided into two parts. The combustible gases are supplied to the distributing flue B, with which there are connected the distributing chambers C, which can be closed by dampers D and by means of which each half of the furnace is supplied with the requisite quantity of combustible gas. A second set of dampers E regulates the supply of gas to the upper half of the oven. From the chambers C, there branch off the passages F G, by means of which each of the vertical heating flues H I is separately supplied with combustible gas. These flues are supplied with air to support combustion. For example, the passages F G leading to these flues may be duplicated (as shown in the sectional view), wherein the right-hand passage G of each pair supplies gas, and the left-hand passage air to the flue I.

In each half of the furnace the walls of the chambers are heated by the ascending vertical passages H I and the descending passages K L. Each ascending passage can be regulated by a damper M of the usual kind. To facilitate the adjustment of these dampers, there are provided in the roof of the oven horizontal passages extending to the front wall of the corresponding step of the roof. These can be closed at their inner and outer ends by removable bricks.

Measuring the Flow of Liquids.

BOWLEY, J. W., of Harborne, Birmingham.

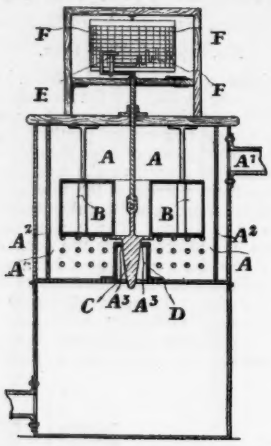
No. 8328; April 6, 1910. No. 17,470; July 22, 1910.

This invention relates to means for measuring the flow of liquids in apparatus which broadly comprises a measuring receptacle with a float in it carrying a valve plug which acts in conjunction with the outflow aperture from the measuring receptacle, so as to give certain definite apertures according to the position of the float and the valve plug, and, which positions are suitably recorded.

A (p. 238) is a liquid receptacle, of any approved form, with an inlet A^1 and an inner perforated cylinder A^2 for breaking the force of the inflowing liquid. The outflow is through an aperture A^3 cut at an angle to form the actual measuring orifice which is toward the receptacle with a knife-like edge. In the receptacle A is a float B, to which is secured a valve plug C. The float is guided so as to ensure its moving vertically. The valve plug is composed of a number of known cross sectional areas which act in conjunction with the orifice of the outflow to give certain definite sizes or areas to the orifice as the plug is moved through it in one direction or the other by the action of the

float. The variations in the amount of liquid flowing through the apparatus and the total amount in any given time are thus readily accounted when the aperture sizes are recorded and known.

The patentee finds the valve plug of conoidal shape (as shown) is a suitable form for the purpose of the invention; and he prefers to arrange the co-operating orifice so that the measure is at one plane only, and below it the aperture is opened away as clear as possible, so that no acceleration or retardation of speed of the flow is caused which would vary the suction on the plug. Therefore rectifying devices are unnecessary.



Bowley's Liquid Measuring Recorder.

In the arrangement shown, the orifice is carried by a raised cylindrical or conical chamber D, which protects the valve and plug from eddies caused by the incoming liquid, and prevents the ingress of dirt, &c. The chamber is of such a shape and size as to give a clear and unobstructed passage below the measure point or plane.

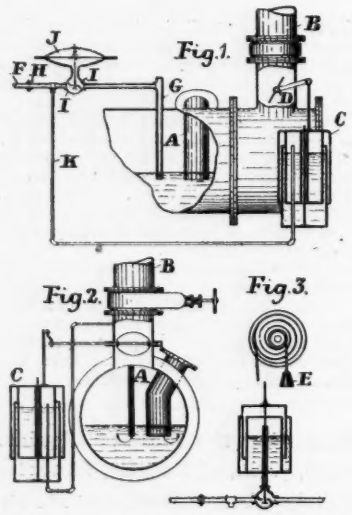
One method of recording the relation of the plug and the orifice is to connect the valve plug or float direct to a pencil E moving over a clockwork drum F or other recording medium. In this way, "an exceedingly simple measuring apparatus is obtained which may be constructed to permit very considerable variation in the flow to take place still accurately recording the amount passing."

Pressure Regulators for Gas-Plants.

Cross, F. L., of Madison, Wisconsin, U.S.A.

No. 12,009; May, 14, 1910.

This invention relates to the maintaining of a constant predetermined pressure in the hydraulic main of gas plant, by embodying an arrangement whereby the gas is prevented from getting access to the means whereby the auxiliary regulating valve is actuated, and also from the auxiliary valve itself.



Cross's Pressure Regulator for Hydraulic Mains.

Fig. 1 is a side elevation (partly diagrammatic) of a portion of the hydraulic main of a gas plant equipped according to this invention. Fig. 2 is an end elevation. Fig. 3 shows details of a regulating gas-holder counterbalance sheave.

The usual hydraulic main, with inlet pipes A, dipping into the liquor in the main, has a discharge pipe B, in which a valve or damper of butterfly type is pivotally secured. The float chamber or tank C is connected by a link and lever to the stem D of the valve; so that it closes the valve when it rises and opens it as it falls. The tank is balanced in any preferred manner, as by a weight E and cable passing around a compensating drum, whereby the increase in weight of the tank as it rises out of the water seal is provided for. The gas is drawn from the main through the outlet by the usual exhauster.

A pipe F leads from any source of gas under pressure external to the gas in the system passing through the hydraulic main. It has an arm G extending into the main with its open end dipping into the liquor on a level with the inlet pipe. The pipe preferably has a contracted inlet as a reducer H, admitting a comparatively small jet of gas; and between it and the arm G is an automatic regulating valve I, adapted to close under abnormal back-pressure in the pipe. The valve has a closure connected to a diaphragm secured across a pressure drum J, and counterbalanced by a spring whose tension may be adjusted as desired. A bye-pass K, discharging directly into the tank C, opens from the pressure pipe beyond the regulating valve.

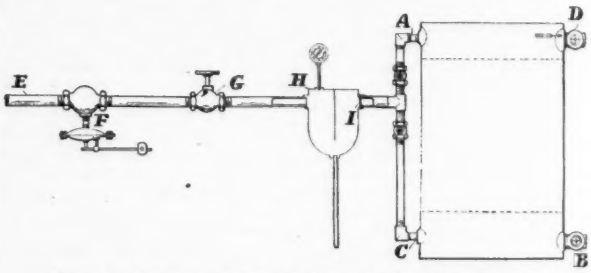
In operation, the auxiliary regulating valve is adjusted to remain open and allow gas to pass into the main around the submerged margin of the upright arm with sufficient pressure in the bye-pass to hold the tank C, so that the outlet damper is open sufficiently to keep the required pressure in the hydraulic main. If the pressure in the main falls, the resistance of the flow of gas through the pressure pipe H is lessened, whereby more gas flows to the main and correspondingly less to the tank C, whereby it falls, partially closing the damper until equilibrium is restored. If the pressure rises for any reason, the resultant increase of back-pressure lifts the diaphragm, thereby choking the flow through the pressure pipe and forcing more through the bye-pass into C, which rises and opens the damper, relieving the pressure in the main.

Volume Regulator and Indicator.

Cross, F. L., of Madison, Wisconsin, U.S.A.

No. 12,010; May 14, 1910.

In the manufacture of certain kinds of gases, wherein steam is admitted to the generating system at some step in the process, it is necessary, the patentee points out, in order to obtain uniformity in the product, that a definite volume of steam be delivered to the apparatus during a certain period of time, and that it be readily ascertained by the operator that this required volume is being provided.



Cross's Volume Regulator for Steam in Water-Gas Plants.

The illustration (largely diagrammatic) is of a volume regulator and indicator embodying features of the invention shown in connection with a gas-producer of the type wherein steam is forced into it from its ends alternately, as through an outlet A and outlet B, an intake C, and exhaust D—shut-off valves and conventional fittings being used to accomplish this, and the steam being supplied from any convenient source through a main E. A constant pressure regulator F receives the steam and discharges it at a uniform initial pressure through a throttle-valve G into a steam-separator H. A diaphragm, with apertures I, is placed in the outlet of the separator, and a gauge indicates the pressure maintained at all times.

The weight or pounds per minute of gas, steam, or the like passing through an orifice is expressed by the formula—

$$w = \frac{6}{7} a p c$$

in which w = pounds per minute; a, the area of the orifice; p, the pressure; and c, a constant depending on the nature of the orifice, and in a thin disc being 0·63. If w be made equal to p in the formula, a definite value for a or a certain definite area is found for the orifice. This area is given the aperture I in the disc; and the weight per unit of time delivered through it, or pounds of steam per minute, is consequently equal to the initial pressure or pounds pressure at which the steam is delivered to the disc. As the latter is indicated by the pressure-gauge, the operator can instantly see by a glance at the dial how much steam is passing through the disc. Furthermore, the size of the main is so proportioned in relation to the orifice that the pressure of steam as it issues from the orifice is not more than three-fifths of the initial or gauge pressure, as under this arrangement any fluctuations in the back-pressure in the system beyond the disc will not affect the velocity of the steam passing through the orifice.

The throttle-valve G is adapted to be locked when set at any point. It is used as a convenient means for increasing or decreasing the pressure of steam entering the separator, instead of re-adjusting the automatic pressure regulator F in case it is desired to change the volume of steam.

Impregnating Incandescent Gas Lighting Filaments and Mantles.

Bagrachow, G., of Paris.

No. 18,084; July 29, 1910.

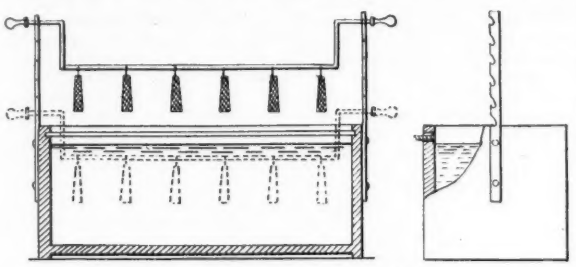
This invention relates to a process for covering bare filaments of any sort of incombustible or refractory material or metallic threads with rare earths having incandescent properties; the process may also be applied to mantles built up of cotton, ramie, silk, and the like. These filaments or threads can be formed in the shape of a mantle before the impregnation process, so that after the application of the process the

finished mantle is as rigid as is required for incandescent gas lighting. The impregnation process is equally applicable to the reinforcement of existing mantles or for renovating used mantles.

In order to cover the bare filaments (particularly very thin metallic threads of platinum, nickel, &c.) in the form of mantles, an immersion bath is used formed of a solution of rare earths in alcohol, ether, &c., but particularly (and preferably) highly concentrated solutions having an alcohol base. The rare earths employed in the bath are those generally used—zirconium, &c.

The filaments or mantles to be impregnated must be immersed in the bath at the same time as they are heated; the simultaneous immersion and heating being continued for a greater or less period of time according to the thickness of the deposit of rare earths required. In order to ensure the constancy of the heating of the filaments during immersion, a constant temperature—not too high—is obtained by setting alight the alcohol bath in which the filaments are plunged. In this way the mantles keep their shape—a matter of importance with mantles formed of very thin metallic threads; and a regular impregnation of the metallic threads is obtained, and they are covered by a layer of rare earths of a greater or less thickness, which adheres firmly to the metallic thread.

The process can be applied to mantles built up of cotton, ramie, silk, &c., for the purpose of increasing their rigidity and lighting power. These mantles thereby become more rigid, so that one can dispense with coating them with collodion for the purpose of transport; and it is possible to remove them from the burner for the purpose of cleaning it without risk of breaking them. The mantles treated in this manner have, it is said, further advantages as regards illuminating power. The process is also applicable to used mantles of all kinds, and allows these to be renovated—that is, the mantles are impregnated again in order to restore their rigidity and to augment their illuminating power.



Bagrachow's Mantle Impregnator.

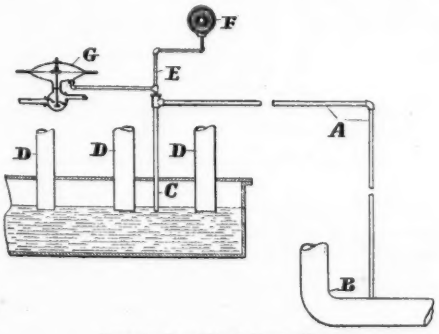
The process is easily carried out. It is possible, for example, to treat a row of mantles simultaneously by using a vessel like that shown. It contains a concentrated solution of rare earths in alcohol, and can be formed, if desired, with a sliding lid. Notched side brackets are arranged to support a bar on which are hung the mantles—for example, mantles formed of platinum or nickel threads. When the bar is supported high up on the brackets, the mantles hang freely above the bath, and when the bar is hung on a lower notch on the brackets, the mantles are immersed in the bath. The mantles being arranged on the bar above the bath, the lid is withdrawn and the alcohol set alight for the purpose of slightly re-heating the mantles. Then these are immersed in the flaming alcohol. The longer the mantles are left in the flaming bath the greater is the deposit of rare earths. The mantles can then be withdrawn, and can be carried above a row of bunsen burners for the purpose of evaporating the alcohol with which they are impregnated.

Operating Controlling Apparatus in Gas-Plants.

Cross, F. L., of Madison, Wisconsin, U.S.A.

No. 17,575; July 25, 1910.

This invention relates to a method for utilizing the pressure in the hydraulic main (or any other part of the system in which crude gas is contained or through which it is conducted) of a gas generating system for actuating the recording, regulating, indicating, or controlling apparatus.



Cross's Gas-Plant Controller.

A diagrammatic view is shown of a hydraulic main of conventional type, together with a supply or service main, and an arrangement of parts which constitutes one means for carrying out the method referred to, which consists in introducing into the hydraulic main a current of purified gas, from some portion of the system that is most convenient, under pressure that varies as the pressure in the main, and operating the recording or controlling apparatus by this refined gas. That is, the pressure of the crude gas is transmitted through an incoming current of purified gas to any apparatus operated by the refined gas responsively to this pressure.

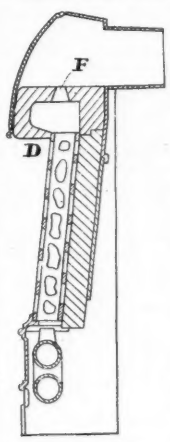
The pipe A leads from a service main B, filled with gas, which will not foul the apparatus nor injure the gas in the main, under a pressure greater than the pressure maintained in the hydraulic main. It has an upright delivery end C entering the hydraulic main and dipping into the liquor to the same depth as do the retort pipes D, so that the consequent pressure in the pipe A varies with that in the dip-pipes. At any convenient point near the main, a branch E, from the pipe A, leads to a pressure-gauge F, or any other piece of apparatus (such as a regulator G or like device) which would become fouled and disabled if the unrefined gas of the main itself should come in contact with it.

Gas-Fires.

Aird, K., of Falkirk, N.B.

No. 18,967; Aug. 12, 1910.

This invention relates to gas-fires of the kind in which the "fuel" is made in the form of columns of honeycombed refractory material supported from below in front of a slab of fire-clay or the like held in a grate or fireplace; and it has for its object to provide improved means of retaining the columns in position at the upper ends, while leaving the main body of the fuel unobstructed in front for free radiation of heat—the retaining device also serving as a means for baffling the upward flow of the burnt gases.



Aird's Gas Fire "Fuel."

The blocks of "fuel" are shown supported on a flanged ledge of the fire-grate or framing which carries the fire-brick slab in the usual way. But at the upper end the blocks enter a slot or groove in the under side of a hollow brick or slab D, or a plate, or the like, which is fitted within the canopy of the grate. This member D is perforated at its upper side to form an opening F (preferably over each column); so that the burnt gas which passes from the top, after circulating in the cavity of the member D, escapes into the canopy and through an outlet at the rear into the chimney. The fuel blocks are thus firmly supported at their upper ends by the member D, as well as by the usual flanged ledge below; while the intervening part of their length is unobstructed.

Gas-Purifier Grids.

Robert Dempster and Sons, Limited, and Broadhead, J. W., of Elland.

No. 19,573; Aug. 22, 1910.

In patent No. 12,894 of 1910 [see "Journal" for Feb. 21, p. 532] were described grids for gas-purifiers composed of rows of loose bars of wood laid upon the crossbars or other bearers—the bars of one row overlapping those of the adjoining row or rows. The present improvements upon this method of forming the grids are intended to prevent undesirable movements of the bars.

For this purpose, the patentees propose to lay upon, or secure to, the upper surface of each bearer or crossbar a metal plate having a number of vertical abutments, walls, or stops, projecting upwards; each abutment at one side of the plate being opposite a space between two similar abutments on the other side, so that when the bars are laid in position—each bar passing through one of the spaces and abutting against one of the stops—longitudinal movement of the bars will be prevented.

If the stop walls be provided with short side walls at right angles, between which the ends of each bar enter, lateral or transverse movement of the bars will also be prevented. This construction is especially useful where the bars are narrower than the intervening spaces; so that they are not otherwise retained at the correct distances apart by the intervention of the bars in the next row or rows.

Instead of a continuous plate, loose clips or stop pieces adapted to hook over the edge of the bearer may be arranged with their vertical upward projections alternately at the right and left sides of the bearer

Coin-Freed Apparatus for Supplying Gas for a Predetermined Period.

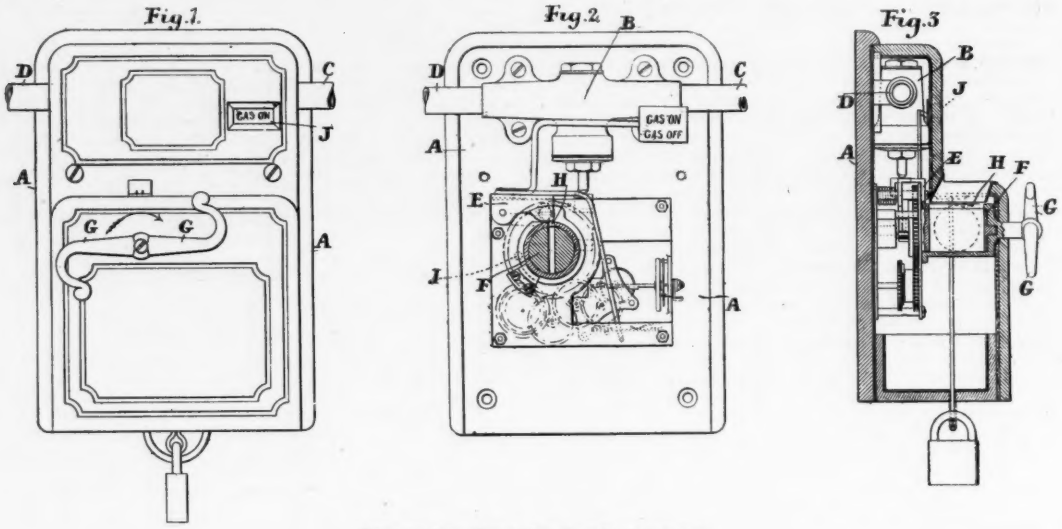
Edgar, W., of Hammersmith, W.

No. 23,179; Oct. 6, 1910.

This invention relates to apparatus as described in patent No. 5851 of 1902, where, on the insertion of a coin and the turning of a handle, clockwork mechanism can be wound up and a gas-valve opened, which remains open until the mechanism has run for a specified time, when it closes the valve and shuts off the gas. During the movement of the clockwork, the coin pocket is returned to its original position ready for a fresh coin; means being provided whereby, on the turning of the handle to wind up the clockwork, the mechanism is stopped.

Fig. 1 (p. 240) is an exterior of the apparatus. Fig. 2 is an interior elevation, partly in section; the coin-box and its holding appliances being removed (the operating appliances being in position for freeing the clockwork and with the gas-valve open). Fig. 3 is a side sectional elevation of the apparatus.

To the back plate A is connected a valve box B, with, on one side, the gas-supply pipe C, and, on the other side, the pipe D leading to the burners. Just below this valve box is suitable clockwork mechanism having springs between plates held together by posts. To one of the posts is pivoted a lever E, carrying a projection in proximity to



Edgar's Coin-Freed Gas Supply Apparatus.

the valve stem ; also two arms carrying a disc for indicating whether the gas is on or off.

On the axle of one of the wheels of the clockwork mechanism—preferably the axle carrying the spring—is positioned a coin receiver F provided with a coin pocket and also having a bearing preferably by means of a stub within a cylinder carrying the handle G projecting outside the front casing and having a coin opening H corresponding to the coin slot.

Now, supposing the gas to be cut off by reason of the clockwork mechanism having been sufficiently actuated to close the valve, the stop I will have acted upon one end of the lever E and lifted it for the projection on it to close the valve ; the arm to exhibit "gas off" at the sight hole J ; and the arm to have lifted the plate and braked the clockwork mechanism. A coin is now inserted and falls into the slot of the receiver F, and also engages the slot H of the cylinder. The handle G is now turned, and the coin having become locked with the cylinder and the receiver causes the two to move together ; the movement being continued until the stop comes against the grip piece, when the coin receiver will have been moved a half circle, and in this position (on the release of the handle) the coin falls into the box. The coin receiver remains in this position held by the clockwork, and will not be moved until the clockwork starts.

During this movement of the cylinder and coin receiver, the pin I has been moved away from the end of the lever E, and in consequence the lever and its appurtenances have been freed from action on the valve, due to pressure exerted by the clock spring ; but the lever and its appurtenances could not fall and free the valve and clockwork mechanism because the flange was riding under the nose of the lever and holding it up, so that during the whole of the winding up of the clockwork spring the valve was kept closed and the clockwork braked.

To enable the gas-valve to be opened, the cylinder must be turned back to its starting point, when the lever E will fall by gravity or under the action of a spring and its nose enter the cut-away portion of the flange and free the valve, release the plate and exhibit "gas on" at the sight hole J—the parts occupying the position shown in fig. 2.

The clockwork mechanism returns the coin receiver, and when the valve is closed the coin slots coincide.

To turn off the gas at any time, the handle must be turned for the flange to lift the lever E and so close the valve and brake the clock mechanism, as will be understood.

Indicating the Flow of Fluid through a Conduit.

CHRISMAN, H., of Edgewood Park, Pennsylvania, U.S.A.

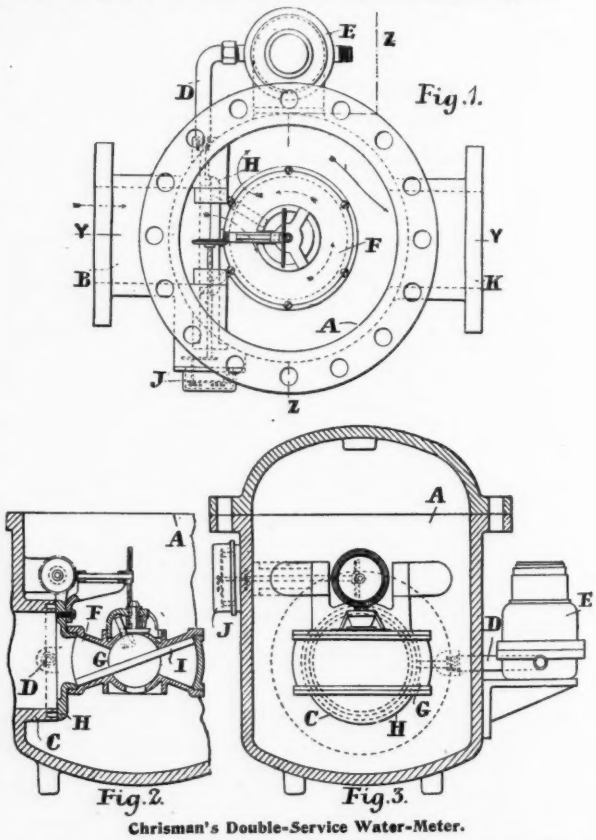
No. 172 ; Jan. 3, 1911. Date claimed under International Convention, Jan. 14, 1910.

It is the purpose of this invention to provide a main or service pipe with a registering meter which will measure the flow (say) in gallons, if the water is being used under normal conditions—that is, for ordinary service use—but will open communication to an auxiliary meter or indicator when an abnormal flow is passing through the main, as in the case of fire service ; and the auxiliary meter will indicate the time during which the abnormal flow has taken place. By such an arrangement, it can be ascertained by inspection if water has been drawn from the main other than in the ordinary manner ; and if an abnormal flow has taken place at any time, the auxiliary indicator will indicate such abnormal condition.

Fig. 1 is a plan of a main to which the invention is applied with the cover removed, so as to afford a view of the interior mechanism. Fig. 2 is a section on the line Y of fig. 1. Fig. 3 is a section on the line Z.

The union is provided with a covered opening A at its top. Concentric with the walls of the inlet B is an inwardly disposed flange C having a circumferential groove in its end, which communicates with a pipe D leading to a time-meter E, which exhausts through a pipe to atmosphere. Above the flange C are brackets on which is supported the measuring chamber F of a water-meter G. The inlet port to the water-meter has a circumferential flange H, which, under normal conditions, rests against the groove in C so as to close it and prevent water from entering the groove when the flange H is seated against the end of the flange C. The meter G is provided with a gyratory diaphragm I, which communicates motion to a shaft and gearing to a register J.

When the water flows into the inlet of the union in the usual way, it follows the path indicated by the arrows, and passes out through the outlet K ; and in this manner all the water passing through the union will be measured according to any known standard. But if from any cause the pressure on the outlet side of the union drops sufficiently, due to abnormal demand at the outlet side or from other causes, the pressure on the inlet side of the meter G will be sufficient to unseat it, so that the groove in C will be uncovered and water will pass out



Chrisman's Double-Service Water-Meter.

through the pipe D into the indicator E, and exhaust through the pipe at the side. When the meter is swept off its seat by the drop in pressure, the flow of the water will be unimpeded, as the weight of the meter itself will be insufficient to retard the flow to any appreciable extent. During the time that the groove in C is uncovered, the indicator E (if a meter) will continue to register ; so it serves as a tell-tale meter or detector meter to indicate the time during which the abnormal condition prevailed.

Thus, in the event of it becoming necessary to make unusual demands upon the mains—as, for example, in the cases of fire service—the meter G and its flange H will be swept out of the path of the flow of water through the inlet B and outlet K, and the flow of the water will be thus unimpeded. During this time the meter G will not register, but the detector meter E will. As soon, however, as the unusual demand ceases, the meter G will gravitate back to its seat—that is, the flange H will rest against the end of the flange C and the meter will again resume registering for all normal flows, and the detector meter will be cut out.

MISCELLANEOUS NEWS.

BRITISH COALITE COMPANY, LIMITED.

Reports of the Directors and Managing-Director.

The Directors of this Company have issued their report for the year ended the 30th of September last, and it will come up for discussion at the meeting of shareholders to be held to-morrow (Wednesday)—adjourned from the 30th ult. in consequence of the absence of the Chairman, Sir William H. Preece.

In the course of their report, the Directors state that the anticipations for a successful year's working have not been realized. Experience has shown that the works of the Company, with the exception of Barking, were situated at points where the local conditions made the manufacture of coalite commercially unprofitable. The result has been that, under the supervision of the Managing-Director, operations are now being centred at Barking, where the plant has been brought to a workable condition; all expenditure wherever possible having been curtailed until the Company has secured fresh working capital with which to profitably develop the business under the new conditions referred to by the Managing-Director in his report of April 10, 1911 [see below]. An arrangement satisfactory to both Companies has been arrived at for the liquidation of the calls on the shares due from Coalite, Limited. Since the date of the balance-sheet, the issue of £300,000 of 5 per cent. first mortgage participating debentures has been restricted to £75,000. The negotiations referred to in previous communications to the shareholders have not yet been concluded. Owing to other engagements, Sir Charles Allen and Sir William Bailey have resigned their seats on the Board.

The following is the report of the Managing-Director (Mr. Herman Clarke) referred to above:

I beg to report herewith upon the operations of the Company since July 11, 1910, upon which date I assumed the position of Managing-Director. The Company at that time were operating at Wednesfield, Plymouth, and Hythe. The operations of these plants, together with the cost of the executive staff, technical advisers, and experts, was entailing a loss of between £30,000 and £40,000 per annum. Such a condition could only mean either: (1) That the coalite process itself—that is, the carbonization of coal at a low temperature—was a fallacy; or, and (2) that the management was extravagant, untechnical, and unbusinesslike. I set out at once to satisfy myself whether either one or both of these assumptions were true. I therefore went carefully into the commercial aspect of the process.

The resultants of coal carbonization are well known, and the laws governing the products of such carbonization well understood; so that it was quite apparent that a relation between the products of carbonization at a low temperature and those of high-temperature carbonization (gas and coke oven products) could be made, and a fairly accurate comparison arrived at. Under the coalite process, the relative percentage of fuel is about the same, the gas production is less than half, the yield of tar is more than double, the sulphate yield is much below that of the other methods; and while the yield of gas is much less, it is much richer in lighting and power value. Consequently, the question resolved itself into whether the loss in gas volume and ammonia could be taken up by its lighting and power value, together with the increased yield in tar.

On examining into this position, I quickly discovered: (1) That the process could not be considered (except possibly in a few isolated instances) as in any way a gas lighting proposition, but must rather be considered as a coking proposition, producing a domestic instead of a manufacturing coke. (2) That the Company—due to incompetent and ignorant management—were not operating within 50 per cent. of the theoretical value of the process, because: (*a*) While theoretically the fuel (coalite) dropped from the stills amounts to 70 to 75 per cent. of the coal carbonized, only 40 to 45 per cent. was deliverable to the customer, due to its friable nature, disintegration under weather conditions, and the unmechanical way it was handled; (*b*) that the tar distillates produced at the heats were of so low a specific gravity, so full of sulphur compounds, and rectified by such a crude process as to be almost unmarketable; (*c*) that, due to the unscientific construction of the batteries, the sulphate of ammonia ran below 9 lbs. per ton of coal, instead of between 16 and 18 lbs.; (*d*) that the gas produced did not average above 4000 cubic feet per ton of coal. In addition, the gas plants and tar distilleries were designed and built upon such antiquated and obsolete lines that any hope of operating on a profitable basis had to be abandoned. In consequence, the contemplated contracts with various gas companies were cancelled, and the Wednesfield, Plymouth, and Hythe plants closed down, the entire working forces at all these points discharged, and all unnecessary expenses cut off, with the result that, instead of working at a loss of from £30,000 to £40,000 per annum, the Company's operations to-day show only a slight deficit, which is principally due to the excessive cost caused by the lack of modern labour-saving devices for handling the products.

The investigation into the theoretical conditions had convinced me that, could these conditions be carried out in practice, a profitable business could be carried on in certain districts. Taking a relative proportion between the cost of the coal for carbonizing and the net selling price of the fuel when produced, it is quite evident that a raw material which costs a certain price and which loses 35 per cent. of its volume in working must produce saleable products that will take up the loss of 35 per cent., *plus* working charges, interest, depreciation, and management, and also be in a locality where the fuel consumption is large enough to take the product under the most adverse conditions. The Barking property of this Company is ideally situated. The demand for a smokeless fuel in the Metropolitan area is practically unlimited, the cost of coal for carbonization low, and the bye-products of gas, tar distillates, and ammonia, in the best market. So that the problem resolved itself into producing at Barking coalite and its bye-products up to or beyond the theoretical value of the process. I was thoroughly convinced that there is a point of temperature of carbonization which is commercially efficient in the production of a free lighting, smokeless fuel from the carbonization of bituminous coal, taking into consideration the fuel itself, the gas, tar distillates, and ammonia produced. What point of heat this was, I did not know; but I set myself to find out. For obvious reasons, it is not wise to set forth here where this point is; but that we have found it there is no manner of doubt.

We have been operating at Barking for six months under a process which, while it differs in detail from the old coalite process, is within the limits of our master patents, which, we are advised by our patent agents, have undoubtedly been strengthened, and we are producing: Coalite, free lighting, smokeless, and clean, equal to 60 per cent. effective to the customer; gas, equal to 6500 cubic feet per ton of coal of 17-candle power and a B.Th.U. value of 700; sulphate of ammonia equal to 24 lbs. per ton of coal carbonized; tar distillates free from sulphur compounds, and of a specific gravity which brings them into free competition with the tar distillates from gas-works; crude benzol equal to 1½ gallons per ton of coal carbonized. Unfortunately, the batteries at Barking must be reconstructed, the gas side of the plant modernized, the tar and sulphate plants enlarged, and, in addition, proper bunkers for both coal and coalite and mechanical handling and screening plants installed. The whole works require to be brought to an up-to-date modern condition.

To erect plant capable of carbonizing 300 tons per day and to provide the necessary working capital will require £50,000. Below I give the earning capacity of such a plant, based upon the result of our known operations and at the minimum prices received for our products over the last nine months:—

Gross Cost.	
300 tons of coal, at 11s. into works	£165 0 0
Labour, including works management, at 2s. per ton	30 0 0
	£195 0 0
Gross Revenue.	
165 tons of coalite (55 per cent.) at £1	£165 0 0
15 tons of coalite nuts, at 15s.	11 5 0
10 tons of coalite breeze, at 5s.	2 10 0
5100 gallons of tar, at 3d. (considered on basis of rectified product)	63 15 0
2·6 tons of sulphate of ammonia, at £8 net	20 16 0
300 gallons of benzol, at 4d. per gallon	5 0 0
	£268 6 0
Total gross revenue	£268 6 0
Total gross cost	195 0 0
Gross profit per day	£73 6 0
Operating 300 days per year (£73 6s. × 300) equals	£21,990 0 0
From which should be deducted depreciation, taxes, general management expenses, and salaries	7,500 0 0
Net revenue per year	£14,490 0 0

In estimating quantities, prices, and profits, no account is taken of the surplus gas made. This should amount to about 900,000 cubic feet per 24 hours, which, at the low price of 6d. per 1000 cubic feet, would add over £6500 per annum to the income.

I do not wish to imply that we have as yet reached the highest point of mechanical and commercial efficiency; for we have still much to learn and apply. Yet I do wish to say that, with intelligent and business-like management, the process itself can be made of great commercial and economic value, and will in time come to be recognized as such by the scientific and business world. The earning capacity upon actual capital cost is quite as large as its sister industry, the coke-ovens, which are recognized as among the most profitable commercial undertakings of the present day; and it is quite within the bounds of probability that in time the earning ability of this process will far exceed that of the manufacture of metallurgical coke.

Press Comments.

"Financial Times," April 22.

Shareholders in the British Coalite Company have until Wednesday next, when the ordinary general meeting will be held, to consider whether the experience they have obtained regarding the possibilities of coalite as a commercial proposition has not been gained at too great a cost. The report for the year ended the 30th of September last shows a loss for that period of £45,400; making a total deficit on working account to date of £100,600. To this must be added the loss incurred in connection with the erection of works at Wednesfield, Plymouth, and Hythe, which have been closed-down owing to their unsuitability to the purposes for which they were intended. This course has involved the cancellation of the contracts with various gas companies, concerning which so much was heard when the negotiations relating to them were in progress. One way and another, therefore, the experimental production of coalite has cost a sum which, under the most favourable circumstances, can scarcely be recovered for many years—if ever. The Managing-Director (Mr. Herman Clarke), in his report addressed to the Board, has compiled certain statistics, the net result of which is to indicate that "in certain districts" the business of producing coalite can be carried on profitably. . . . But the statements he makes regarding future profits must stand the test of time before they can be relied upon. The figures now submitted by Mr. Clarke are subject to so many fluctuating factors that their value must be regarded as entirely problematical.

"Pall Mall Gazette," April 22.

This journal has never enthused about coalite; and the position we have taken up has certainly been justified by events. The British Coalite report is bad enough in all conscience; there having been a loss for the year ended Sept. 30 last of £45,400, and there is now a total debit balance on working account to date of upwards of £100,000. This does not include, of course, the loss incurred in connection with the

construction of the works at Wednesfield, Hythe, and Plymouth; which have all been closed-down—operations being now carried on exclusively at Barking. Contracts with gas companies at the various centres have had to be cancelled; and altogether the Company has, so far at any rate, had a disastrous experience. The Managing-Director, in the course of a lengthy report, is still optimistic; but whether his optimism will be shared by the proprietors at next Wednesday's meeting remains to be seen. With coalite not yet out of the experimental stage, and more money required in the near future, the outlook certainly does not seem hopeful, to put it mildly.

PRESTON GAS COMPANY'S PROVISIONAL ORDER.

Important Amendments.

In the "JOURNAL" for the 14th ult., we reported the proceedings in an inquiry held on behalf of the Board of Trade into an application made to them by the Preston Gas Company for a Provisional Order to authorize a reduction of the illuminating power of their gas to 14 candles, and for other purposes. The Board have granted the Order, but with certain amendments; and it will be included in one of the Provisional Order Bills to be introduced during the session.

In the Draft Order, provision was, of course, made for testing the illuminating power of the gas; but nothing was said as to the pressure at which it was to be supplied. It is now specified that this is to be not less than 8-10ths "at the main, or as near as may be to the junction therewith of the service-pipe supplying the consumer." Any gas examiner duly appointed may test the gas for pressure at the testing-place, "or at any public lamp," whenever he may think fit, and the Company are to afford him all reasonable facilities for doing so.

Another new clause relates to the price of gas; the standard being fixed at 3s. 4d. per 1000 cubic feet as from the first quarter day after the commencement of the Order. Section 47 of the Company's Act of 1894 is to be read and construed as if this price had been inserted, instead of 3s. 10½d. and 3s. 5½d. as the section now stands. A further new clause regulates the charge to be made for gas supplied by means of prepayment meters. [This is the ordinary model clause.] The Company are not to demand for any gas supplied through a prepayment meter a greater charge than for gas supplied to private consumers within their limits through any other kind of meter or by any other method of supply. They are not to charge for the hire of any prepayment meter and fittings any other sum than one calculated according to the quantity of gas supplied through the meter; and the maximum amount to be so charged is to be at the rate of 10d. per 1000 cubic feet, to include the hire of the meter and the fittings, or at the rate of 1s. per 1000 cubic feet if the fittings include a cooking-stove. The charge is to include the providing, letting, fixing, repairing, and maintenance of the meter and fittings, as well as the cost of collection and other expenses incurred by the Company in connection with the meter and fittings. The maximum charge for the hire of a prepayment meter without fittings is to be 10 per cent. per annum on the cost of the meter.

Another new clause provides for the redemption of obsolete capital. In any year after the present one in which the divisible profits of the Company exceed the amount required to pay the standard dividends, they are to transfer to a fund—to be called the "capital redemption fund"—the balance of such divisible profits remaining after paying the standard dividends and carrying forward to the credit of the profits for the next year such a sum as the Directors may determine, but not exceeding the amount needed to pay one year's dividends on the preference and ordinary capital for the time being at the authorized rates. Every sum so transferred is to be applied as soon as reasonably possible to the purchase of ordinary or preference shares or stock in the capital of the Company. Any purchased shall forthwith be cancelled and extinguished. As soon as the Company have applied sums amounting in the aggregate to £100,000 to the purchase of shares or stock, this provision is to become inoperative.

Consequent upon the alteration in the illuminating power of the gas, the Order as amended specifies that the Company are, when required, at any time within two years from the commencement of the Order, to do so by a consumer, supply to him, and fix free of charge, a sufficient number of flat-flame burners suitable for the consumption of gas of the illuminating power prescribed, in substitution for the burners (not being of the incandescent kind) in use by the consumer at the commencement of the Order. Notice to this effect is to be printed upon every demand note for gas charges payable to the Company during the two years.

MANCHESTER GAS AND ELECTRICITY PROFITS.

Increased Grants in Relief of Rates.

At a Meeting of the Gas Committee of the Manchester Corporation held last Wednesday, the results of the past year's working of the Gas Department were presented. The statistics included the following comparisons of income and expenditure for the year ended March 31.

	Estimated.		Actual.
Income	£750,500	..	£791,029
Expenditure	585,867	..	583,122
Gross profit	£164,633	..	£207,907
Net ,,	114,633	..	161,375

The estimated surplus was £43,073; whereas the actual amount is £89,816. It was pointed out that, while the difference between the estimated and actual expenditure was only £2745, there was a difference of £40,529 between the estimated and actual income, due mainly to high prices received for residuals. Coke yielded £17,724 more than was estimated; tar, £7383; and sulphate of ammonia, £5503.

The Chairman of the Committee (Alderman Gibson), having paid a special compliment to the Cheif Engineer (Mr. James G. Newbigging, M.Inst.C.E.) and to Mr. F. A. Price, the Superintendent, said the Committee were able to congratulate themselves upon results far in excess of their anticipations. The number of consumers had increased by 2856; the present total being 181,346, of which 63,653 are slot-meter users. The increase in the consumption of gas on the year was equal to 1·75 per cent. It was gratifying to record that improvements in manufacture had resulted in a yield of 11,342 cubic feet of gas per ton of coal carbonized, compared with 11,034 feet in 1910. This increased yield of 308 cubic feet per ton meant, on the total carbonization, a saving of about £6000. As a result of this economy in manufacture, 5366 tons less coal had been used than in the preceding year, notwithstanding an increased output of 94,474,000 cubic feet of gas.

The Committee had under consideration the amount that should be allocated out of profits next year in relief of the rates. It is estimated that for the year ending March 31, 1912, the surplus will be—taking into account the reduction in price to consumers using prepayment meters and concessions to those burning more than 500,000 cubic feet per annum for manufacturing purposes—£49,068; and the Committee propose to hand over £50,000 to the City Fund for the relief of the rates—being £3500 more than last year, but the same as was given in 1909, when pressure was brought to bear upon the Committee to allow this sum in order that an increase in the rates might be avoided. As the estimates for street lighting during the coming year are reduced by £3356 (and so much less is required from the rates), the total difference will be £6856. As announced in a recent issue of the "JOURNAL," the concession made to slot-meter users represents a loss in revenue to the Gas Department of about £7000 a year.

The gross profits on the gas undertaking during the past five years have been as follows: 1907, £166,598; 1908, £162,988; 1909, £140,022; 1910, £167,892; 1911, £207,907. Last May, when the question of the Gas Department's contribution in aid of rates was being discussed at the City Council meeting, Alderman Gibson reminded the members that in the preceding year, in response to urgent appeals, the Gas Committee agreed to contribute £50,000 in aid of the rates; and the result was that at the end of the twelve months they were £2000 to the bad on the net profit made.

The criticisms which during the past year have been directed to the Electricity Committee and their contributions from profits to the relief of the rates, seem to have had some effect. At any rate, at their meeting last Wednesday the Committee determined upon a new method of allocating the profits. It was decided, after considerable discussion, to contribute in relief of the rates in this and future years 1 per cent. on the amount of the outstanding indebtedness of the undertaking. On this basis, the Electricity Department will this year contribute £19,496 to the City Fund, compared with £15,000 last year. This is after paying all sinking fund and interest charges.

As the increased grants from the Gas and Electricity Departments amount to practically the increase on the estimates of the different departments, there are hopes that the city rates may be reduced by 1d. in the pound. All depends upon the improved returns which are expected from the Ship Canal investment.

MACCLESFIELD CORPORATION GAS UNDERTAKING.

A Record Year's Profits.

The Gas Engineer of the Macclesfield Corporation (Mr. William Newbigging) has been able to present to his Committee a report on the past year's working which, so far as profits go, constitutes a record in the history of the Gas Department. As a consequence, there is a larger sum to be handed over in relief of the rates than has ever been the case before. The net profits on the twelve months' working amount to £8275, compared with £7150 for 1909-10. The previous highest net profits on a year's working totalled £8176. With the exception of £500 to be added to the maintenance fund, the whole of the year's profits will be handed over in relief of the rates; £7775 being the largest sum ever applied in this way. At the meeting of the Committee last Wednesday, the following resolution was unanimously passed: "That this Committee desires to place on record its high appreciation of the industry and ability and personal interest of the Gas Engineer, whose management of the works has again resulted in a splendid profit, the amount for the past year being the highest on record—viz., £8275 10s. 1d."

Referring in a leading article last Saturday to the excellent results of the past year's working of the gas undertaking, the "Macclesfield Courier and Herald" said: "We have again to congratulate the ratepayers on a very generous 'meal' by the 'the milch cow of the Corporation.' Once more the gas profits have come to the rescue, and saved the imposition of a ratal burden which would have been very grievous to a large section of the community. We understand that, despite our good fortune through the acumen and ability and industry of our Gas Engineer (Mr. Newbigging), whose capable management has resulted in a profit of £8275 10s. 1d., there will be an increase in our rates, in consequence of unavoidable expenditure on education and other urgent items. What the additional burden will be we shall all know soon enough; but we can even now realize what it must have amounted to had there been indifference in gas-works management instead of alertness, blundering instead of efficiency. Last year's profits amounted to £7150 0s. 10d.; so that this year's show an advance of £1125 9s. 3d., which is equal to a rate of 2¾d. in the pound. The Gas Committee, at their monthly meeting on Wednesday, had much to say of a congratulatory character, chiefly to the Engineer, but not forgetting those who had rendered him loyal assistance, because, however capable may be the head of a huge business department like the gas-works, unless, by wise and genial supervision, he ensures the hearty co-operation of subordinates, it would be impossible for him to achieve the success which we know has resulted from the past year's working. . . . The Committee did nothing more than their duty, and voiced the views of the community at large, in placing upon record their high appreciation of his invaluable services, and the deep interest and ardent desire ever manifested by him to do the best possible for the good old town. We cannot expect every year to achieve the same splendid results; but we at least may enjoy the confident assurance that if the gas-works profits are not in future as large as this year, it will not be the fault of our Gas Engineer."

ROCHDALE GAS AND ELECTRICITY UNDERTAKINGS.

The Past Year's Working.

At a Meeting of the Gas and Electricity Committee of the Rochdale Corporation last Wednesday, the accounts for the year were presented. They showed that the gas undertaking had had a prosperous year, and that there was a net profit of £17,908. This is £4243 more than the surplus shown last year, and £6230 in excess of the profit for the twelve months ended March, 1909. The gross receipts for the past financial year were £93,194—an increase of £5464 on 1910. The gross expenditure was £63,346; being £1222 more than before. This left a gross profit of £29,848, from which interest and sinking fund charges totalling £11,940 had to be deducted, leaving a net profit of £17,908. Extensions and alterations which will cost £25,000 are now being carried out at the gas-works. This amount must be provided out of revenue; and the contracts now in hand represent an expenditure of £23,000.

Having regard to the calls to be made upon them, the Committee decided to allocate £12,000 of the profits in relief of rates. A proposal was made that the amount should be raised to £15,000; but, having regard to the large expenditure now going on at the works by reason of the alterations, including an installation of Glover-West vertical retorts, and the fact that the outlay cannot be covered by loan, the Committee declined to accept the suggestion. As a matter of fact, when the £12,000 grant was proposed, an amendment was moved that the amount should be only £10,000; the argument being that this was as much as the Gas Department could justly and legitimately part with. On a vote being taken, six were in favour of the £12,000 grant and four supported £10,000. With the grant at £12,000, there is £5908 left to be carried to the reserve; and of this £1972 is wanted to meet an account immediately.

The Committee also considered what grant should be made out of the surplus of £5409 shown on the working of the Electricity Department for the past financial year. It was proposed that £5000 should be handed over in relief of rates; but this was defeated, and the amount fixed at £4500 by six votes to four.

Last year the amount taken from the gas profits in aid of rates was £9000; the contribution from the electricity undertaking was £5000.

A special meeting of the Town Council will be held to-morrow (Wednesday), when the estimates of the various Committees will be considered. As there is every prospect of an increase in the rates, it is very likely an attempt will be made to force the hands of the Gas and Electricity Committee, and extract a larger sum than the £16,500 proposed—chiefly from the surplus shown on the gas undertaking.

NELSON CORPORATION GAS DEPARTMENT.

Annual Report of the Engineer and Manager.

The Gas Engineer and Manager of the Nelson Corporation (Mr. A. Morton Fyffe) has presented to the Gas Committee his report for the year ended the 31st of March. It shows that the expenditure on revenue account was £48,665, or £1128 less than the estimates, while the income was £56,332, or £1503 more. The result was a gross profit of £19,994 and a net profit of £7666, which is £2631 in excess of the estimate. The net profit is the largest ever made by the department, and is £3316 more than the previous record since the gas has been sold at the present price of 2s. 3d. per 1000 cubic feet. The quantity of coal carbonized was 30,581 tons, which cost £17,765; and in the manufacture of carburetted water gas 15,952 gallons of oil were used, at a cost of £145. The total quantity of gas made during the year was 351,186,000 cubic feet, of which 6,054,000 cubic feet were carburetted water gas. The make per ton of coal carbonized was 11,285 cubic feet, compared with 11,148 cubic feet in the preceding year; representing a saving of 375 tons of coal of the value of £217 19s. 4d. The quantity of gas sent out was 350,734,000 cubic feet; being an increase of 22,124,000 cubic feet, or 6·73 per cent., on the outsend in 1909-10, and 1·73 per cent. more than the estimate. Of the total, 57·63 per cent. was consumed through ordinary meters, 31·21 per cent. through prepayment meters, 5·34 per cent. was used for public lighting, and the rest burnt upon the works or was unaccounted for. The average ordinary consumption was 32,818 cubic feet, and prepayment meter consumption 15,874 cubic feet; the latter being an increase of 1140 cubic feet. The sum of £14,249 7s. 5d. was collected from prepayment meters during the year. The number of cookers, boilers, and fires on simple hire is now 4302, compared with 4333 this time last year; but Mr. Fyffe says the decrease is more than compensated for by the purchase of appliances to replace those on hire. The stove department dealt with 4446 appliances during the year. The gross income from residuals and bye-products was £13,236; the net income from this source being £11,562. This gives a return of 7s. 6¾d. per ton of coal; making the net cost 4s. 0¾d. per ton delivered at the works, compared with 4s. 5¾d. per ton in the year 1909-10. The only capital outlay during the year was £764 on new mains and £1438 on new meters; making a total of £2202. All the improvements and renewals in the works were paid for out of revenue. The estimates for the current year have been based on an assumed increased consumption of 3 per cent. over last year. They show an estimated gross profit of £20,067, and a net profit of £7503.

Cobham and its Gas Supply.—It is reported that there is a probability of the works of the Cobham Gas Company being taken over by the Leatherhead Gas Company, and that the promotion of a Provisional Order to this end has been agreed to by the shareholders of the former Company. The Cobham gas undertaking has been in existence for nearly forty years, and possesses a rapidly growing district, in dealing with which it has been hampered apparently by lack of capital. The present charge for gas is 5s. per 1000 cubic feet; and oil is used for the public lamps. Under the existing contract, the Council are paying 2s. per lamp per week for lighting the streets with oil; while the last price quoted by the Gas Company was 3s. 6d. per lamp.

VALUE OF LONG SERVICE IN GAS UNDERTAKINGS.

Examples at Manchester.

When making presents to old employees of Messrs. Lever Bros., of Port Sunlight, a few days ago, Mr. W. H. Lever stated that his firm were not among those who held the view that after ten years the staff engaged in a modern business should be entirely changed; and he expressed the belief that, in a rightly constituted organization, efficiency only came with long practice at the occupation followed. In discussing the subject in connection with the Gas Department of the Manchester Corporation, the Superintendent (Mr. F. A. Price) gave some remarkable examples of long service. He stated that his immediate predecessor, Mr. Charles Nickson, who retired not very long ago, had a record of 67 years' service, and was still retained as Consulting Superintendent to the Gas Department. Apart from Mr. Nickson, there were quite a number of men who possessed a proud record. They had 42 collectors with an average length of service of 32 years. In the mains department, there was Mr. Barber, with a half century of service; and associated with him there were many foremen of tried experience. The men in the collectors' department acquired special value from their long performance of the work. They knew their rounds and their people; and the people in turn knew them. Referring again to the mains department, Mr. Price said: "Men who have an expert knowledge of the whereabouts of one thousand miles of pipes in the city, are invaluable. Skill is required in dealing with a gas-main; and by retaining the services of men who have long been accustomed to the work, the risk of explosions is reduced to a minimum. There are, indeed, many occupations in a department like our own where the presence of men long accustomed to the methods and peculiarities of the work are of the greatest possible advantage."

LLANDRINDOD WELLS GAS COMPANY.

At the Fourth Ordinary Meeting of this Company, held on the 12th inst., the Chairman (Mr. Charles Hunt), in proposing the adoption of the report and accounts for the year 1910, remarked upon the satisfactory progress that had been made both in the sales of gas and in the number of consumers, and stated that the prospect for the current year was also favourable in both respects. After providing for payment of the debenture interest, the balance to the credit of profit and loss was £228. It was proposed to write off capital the preliminary expenses incurred during the construction of the works, amounting to £75; carrying forward £153 to next year's account. Debentures to the amount of £1500 were issued during the year, and application had since been received for a further £400. Mr. J. Edwards, of Llandrindod Wells, had, subject to confirmation at the meeting, been elected an additional Director. Mr. Edwards is a member of the Llandrindod Wells Urban District Council, of which he has been Chairman. The report and accounts were approved, and adopted; Mr. Edwards' election to the Board was confirmed; and the retiring Director (Mr. Charles Hunt) was re-elected, as was also the retiring Auditor (Mr. G. H. Sawyer). After the transaction of other formal business, the meeting terminated with a vote of thanks to the Chairman.

WORKHOUSE LIGHTING AT CANTERBURY.

Proposal to Instal Electricity Defeated.

At the Annual Meeting of the Canterbury Board of Guardians last Tuesday, a lengthy discussion took place on a motion—"That electric light be installed forthwith throughout the workhouse buildings."

Mr. BELSEY pointed out that the officers of the Local Government Board strongly advised them not to entertain the idea in the house itself, but they said if there was a new building put up they would willingly sanction it. He did not suppose if the proposal were carried that morning sanction for a loan would be applied for; and the money would have to come out of the current rate. The amount would be anything from £160 to £200; and he felt it would be a great mistake to carry out this work, which they were not absolutely compelled to do. They had no proof a saving was going to be effected in the end.

Mr. WARREN: I have proof to show it will not be a saving.

Mr. NOBLE said he asked the officials what the Local Government Board thought of the matter. The reply was that the light at the house was a good one, and that they could not improve on it—in fact, that gas was better than the electric light. He was further told by officers of the Local Government Board that the warmth of gas was much more than that of the electric light; and that if they adopted the latter, they would require more fires.

Mr. WARREN said that he was sure those who were opposed to his view were equally desirous of doing what they felt to be right in the matter as he was. He then proceeded to speak against the proposal, on the grounds of the present heavy rates in the city, and in view of the opinions of medical men on the question of electric light or gas in institutions of the kind. He quoted a number of medical opinions from the "JOURNAL OF GAS LIGHTING" in favour of gas, both from the ventilating and heat points of view; and passing on to the tests exhibited in the windows of the Canterbury Gas and Water Company's showrooms,* he asked, "Can we, with our eyes open, and with those tests in front of us, say that we shall be supporting the interests of the ratepayers by using the electric light, at this enormous difference in price?" The thing for them to do was to use up-to-date burners. There were only 32 inverted burners, which consumed something like 4½ cubic feet of gas. If the present 142 flat-flame burners were replaced by 70 modern incandescent burners, consuming 3 cubic feet, a saving of over 50 per cent. would be effected. This could be done at a cost of £20.

* Some references to these tests will be found in the last volume of the "JOURNAL," pp. 22, 283, 316, 788.

Mr. RUSSELL said he hoped that those who were shareholders in the Gas and Water Company would abstain from voting.

Mr. BELSEY: We are all shareholders in the electric light.

The CHAIRMAN (Rev. J. Le Mare Shallis) said he would be quite responsible for the action of members. They were free to vote or abstain, as they liked.

Mr. GARDNER contrasted the light from what he described as "the glaring white incandescent burners—inartistic in the last degree"—in the Cathedral and the soft electric light which shone from the beautiful chandelier in the Presbytery in the same building. Instead, he said, of the nice little yellow jets, they got a light which destroyed the sight; and this was the light which Mr. Warren wanted to persuade them was the best for the institution.

Mr. WARREN: Have you seen the tests in the St. George's Street windows?

Mr. GARDNER: I do not take any notice of figures.

Mr. COLLIS, as one of those who previously supported the electric light, said he came before them as a repentant sinner. At the time, a very plausible estimate was given to them from the Electric Light Department, which looked quite satisfactory. Since then, a test had been made, about which much had been said. He did ask the Board very seriously to consider the matter. If they did not agree with the test, then it was a suggestion that it was either fraudulent or fallacious. He felt sure that a Company like the Gas and Water Company would not lend themselves to anything that was in the least degree fraudulent or unfair. To instal the electric light would be gross extravagance.

Mr. DOWNS supported the resolution; his chief reason being that the electric light was the property of the ratepayers. He thought that the Board, as a public body dealing with ratepayers' money, should be a customer to their own institution.

Mr. M'CLEMENS (the mover of the resolution), in replying on the discussion, remarked that gas swallowed up the oxygen and "fouled" the ceilings, so that they had to spend £12 a year on cleaning and decoration. It was a waste of time to suggest that gas could possibly be maintained at the institution as cheaply as electricity. At the Canterbury Borough Asylum, there were 865 electric lights, which cost £100 last year. They were asking for 366 lights for the house, which, at the same rate, would not cost more than £50. The cost, roughly speaking, for the lighting by gas of the workhouse was £220 a year. No one could conscientiously say that gas lighting was a saving on electricity; and, from the ratepayers' view, he thought the installation of the electric light would be a vast improvement.

Upon a vote, the proposition was lost by ten votes to eight.

Mr. DOWNS remarked that two shareholders of the Gas and Water Company had voted.

Lady MITCHELL gave notice that at the next meeting of the Board she would propose that £20 be spent in putting in the house new inverted gas-burners.

LOWELL (MASS.) GAS COMPANY AND PLUMBERS.

Unsuccessful Attempt to Restrict the Company's Operations.

Some time ago, the Master Plumbers' Association of Lowell (Mass.) complained to the State Board of Gas and Electric Light Commissioners that the sale and installation of gas appliances by the Lowell Gas Company was *ultra vires* and unlawful, and further that, owing to the low prices charged, with which they could not compete, they were virtually excluded from what might otherwise be a profitable branch of their business. The Board gave the subject very careful consideration, and came to the conclusion that the acts complained of were not beyond the corporate powers of the Company. In the course of their decision (the full text of which is published in the last number to hand of the "American Gaslight Journal") they made the following observations.

There can be no doubt that under its Charter the main purpose for which the Company was incorporated was to manufacture and sell gas in Lowell and its vicinity. It can exercise only such other purpose as may be subordinate and incidental to this main design. If the Company had abandoned the manufacture and sale of gas, and were now devoting itself exclusively to the sale and installation of gas appliances, this would plainly be *ultra vires;* but such is not the fact. The sale of gas appliances is incidental merely to its main business of making and selling gas, in like manner as its sale of coke, tar, and ammonia is incidental thereto. It is also important to the full accomplishment of this main business; for, by having the Company's customers instal the greatest possible number of gas-consuming appliances, especially such as are designed to utilize gas during the portions of the year when relatively little is required for illuminating purpose, the sale of gas may be, and unquestionably has been, greatly increased. The Supreme Court in this State has repeatedly given a liberal interpretation to what is reasonably incidental to the specific chartered powers of a corporation; and in Pennsylvania, in a case similar to the one under discussion, the Court expressly held that the sale of gas-consuming appliances and conveniences is within the powers of a corporation organized to manufacture and supply illuminating and heating gas.

It would be a distinct menace to the public interest, and a serious embarrassment to proper supervision and regulation, if corporations engaged in the performance of a public service should extend their activities to other lines of private trade or business. So long as the companies keep within what is plainly subordinate and incidental to the performance of their public service, no public interest seems to be injuriously affected or endangered; and for that matter the practice of selling and installing gas and electric appliances may often be clearly of public advantage. In this particular case, the Board is satisfied that no public interest has suffered, and that the acts of the Company which have deprived the master plumbers of a possible profit have, on the other hand, operated to the immediate advantage of the purchasers of gas appliances, and indirectly to the advantage of all gas consumers in Lowell.

Notice of an intended dividend is given in the bankrupt estate of the Bens Gas Company, Limited, of Chichester.

GUISBOROUGH WATER ORDER.

An inquiry has been held at the offices of the Board of Trade, before the Hon. T. H. W. PELHAM, on the Provisional Order relating to the Guisborough water undertaking. Authority is sought to make regulations for the prevention of waste, to prescribe a minimum rate for domestic supply of 8s. 8d. instead of 8s., and a maximum charge for meter supplies of 1s. 9d. per 1000 gallons, instead of 8d.

Mr. TYLDESLEY JONES (instructed by Messrs. Pontifex, Pitt, and Johnson, and Messrs. Martin and Co.) appeared for the promoters; Mr. VESEY KNOX (instructed by Messrs. Lees and Co) represented the Guisborough Urban District Council and the Board of Guardians.

Mr. TYLDESLEY JONES, in opening, said that the undertaking was originally authorized by an Order in 1871, which was granted to Admiral Thomas Chaloner, who was then the owner of the Guisborough Estates, and Mr. Tudor Trevor, his Solicitor. The present undertakers were Messrs. Turton, Whitley, and Hill. Admiral Chaloner had started the works in order to provide water cheaply to the inhabitants of Guisborough, and really as a benefit to them rather than as a commercial undertaking.

Dr. *J. C. Thresh*, who was called on behalf of the promoters, gave evidence as to analyses he had made of the water. He said that the water which was taken from the reservoir was slightly acid and peaty, but not in any way contaminated; while water taken from taps and filtered was alkaline in action, but had no plumbo solvent action. Bacteriologically it was also of exceedingly good quality. A later analysis of the reservoir water disclosed that the acid had been taken out, due to the filtration. In his opinion, there was no necessity to treat the water for plumbism.

Mr. *Clark*, the Agent of the estates, gave evidence as to the carrying on of the undertaking since its inception. The dividend had never reached 4 per cent. He denied that there had been complaints as to the pressure. He had, however, often complained about the waste of water by consumers.

With the addition of the evidence of an accountant, this closed the case for the promoters.

Mr. VESEY KNOX then called

Mr. *H. J. Rofe*, who stated that the water in this case could be treated so as to render it a perfectly good water without the least difficulty; one method being the addition of limestone. Contrary to Dr. Thresh, he considered the present filters could be used without the expenditure of some £1500 on new Gandy filters. It was also stated by the Chairman of the Urban District Council that serious complaints had been made as to the pressure and purity of the water. In his opinion, the water supply should not be in the hands of private individuals.

Mr. VESEY KNOX submitted, in the first place, that the Order should not be granted at all, and that at all events a Company should be formed to take over the concern. [Counsel for the promoters agreed to this.] He then reviewed the evidence, and, referring to the proposed maximum price of 1s. 9d., said that the Model Bill price was only 1s.

Further evidence having been heard on behalf of several objectors,

The CHAIRMAN said he would report on the matter to the Board.

WELL BORING AND MACHINERY.

In the course of a paper which he read recently before the Association of Engineers-in-Charge, Mr. W. H. Booth gave the members a great deal of information on the subject of "Water and Petroleum Boring and Machinery."

He pointed out that drilled wells were made in Artois, in France, and therefore called "artesian." The term artesian was supposed to be confined to such wells as yielded a supply which overflowed the surface; but as this depended so much on the height of the surface, it appeared that the term might very well be applied to all bored wells, as distinct from dug wells. A bored well was no longer of necessity smaller than a dug well, for the boring system was now carried out in sizes big enough to form the shaft of a coal mine. It was all a question of power and tools. After briefly describing the various systems of boring in vogue, the author pointed out that it was only by well-boring that a correct knowledge of deep-seated geology could be acquired. Well borers, he said, were glad enough to gain information from the geological survey, but had been far too careless in keeping records; and much valuable knowledge had been thrown away in this manner. Everyone who had to do with boring should insist on the systematic keeping of every sort of material passed through, together with a careful, if simple, record of accurate depths. Particular note should be made of the appearance of water and its level. The best way to determine the likelihood of water at any site was to study the geology of the neighbourhood, and find out all the local information possible—such as the level of springs, the depth of other wells, and their water-level. No information should be disregarded; for sometimes trivial matters would throw a useful light on the subject.

Mr. Booth had a few words to say about water diviners, who, he remarked, often believed quite seriously in their powers. That they experienced certain sensations which sometimes might be due to radio-active water, he was willing to admit; but they felt the influence of something when walking over great depths of close clay, and whenever investigation had been fairly made he believed they had been found lacking so far as concerned water. Put enough of them into an enclosed area, and they had each been found to discover water (as shown by Professor Wertheimer) at more than one place, and every place pegged out differed; so that, given enough diviners, one might woodpave one's garden with pegs.

Dealing with geology, he stated that for about 1100 to 1600 feet the geological conditions under London appeared to be regular; and the following sequence obtained generally: Surface gravels (not always present), London clay, Reading clay, Woolwich sands and clays, Thanet sand, chalk, upper greensand, gault, and lower greensand (absent in the

Central London area). Water was found in the sands of the Woolwich beds, and also in the Thanet sand, which, however, would not usually stand up to let the water be abstracted. The chalk was the usual source of supply; and in the London area proper now the only one—for long years of pumping, had reduced the water-level below the originally water-bearing upper rocks.

The latter portion of the paper was devoted to a consideration of the question of pumping. In this connection, Mr. Booth remarked that, at its best, the air-lift system probably absorbed three times the power per 1000 gallons raised that was needed by a bucket pump; but, at the same time, it must not be forgotten that, if the borehole was small, and a given supply must be obtained, the air lift would get this supply (if it was there) from a hole which could not take in a pump half large enough to do the duty.

TAKING OF WATER BY LOCAL AUTHORITIES.

A Bill has been introduced by Mr. Leif Jones, the Member for Rushcliffe (Notts.), to amend a defect which has been found to exist with regard to the taking of water by local authorities otherwise than by agreement. The circumstances which gave rise to the Bill are set out in the "Memorandum" attached to it.

It appears that in the report made by the Select Committee of the House of Commons on the Public Health Act (1875) Amendment Bill (1878), they pointed out that it had been generally believed that, under the Act, Provisional Orders could be obtained by which water rights could be compulsorily taken. Several Orders had, they said, been granted in the belief that this taking of water was legal under the meaning assigned to the word "lands," which was supposed to include "easements and hereditaments of any tenure." A Committeeof the House of Lords, however, had decided, when considering a Provisional Order for the compulsory purchase of water rights by the West Houghton Local Board, that the Order was *ultra vires;* and it was not confirmed. The law officers of the Crown were then consulted, and they expressed the opinion that in issuing a Provisional Order under the 176th section of the Public Health Act, 1875, the Local Government Board could not confer upon a local authority power to purchase for the purposes of the Act, and otherwise than by agreement, any right to abstract water from a stream. The House of Commons Committee considered that this decision would produce serious inconvenience to sanitary authorities; for it was apparent that before water could be taken from a stream by a sanitary authority for the supply of their district, an agreement would have to be made with every owner, lessee, and occupier below the proposed intake who might be affected by the abstraction of the water. It was recognized that the consent of people having these water rights would be difficult to obtain. The Committee therefore recommended that, with the view of affording local authorities facilities for acquiring the right to take water from any stream, the Local Government Board should be empowered to issue Provisional Orders which, on confirmation by Parliament, would confer authority for the purpose. They thought the Order should incorporate the Water-Works Clauses Act, 1847, in the same manner as is usual in a Private Bill; but prior to the issue of the Order, the statutory notices should in all cases be published and served by the local authority.

The Bill which has been introduced carries out the recommendations of the Committee.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

We have now heard the last of the Kirkcaldy gas transfer; Lord Shaw of Dunfermline, the Oversman, having issued his final interlocutor on Thursday. It is to the effect that, having heard Counsel on the representations and answers, and having considered a joint minute for the parties, the Oversman adheres to his proposed findings, contained in his interlocutor of March 29, and remits the accounts of expenses incurred to the Company and to the Clerk to the Reference, along with the expenses and accounts of the Oversman and Arbiters, to the Auditor of the Court of Session for taxation. The statement is published to-day in a Kirkcaldy newspaper that Bailie Wright, the Convener of the Gas Committee, returned from London on Saturday, where he had been engaged with the representation from the Town Council against the award relating to the purchase of the gas undertaking. The Town Council, it is stated, wished to be satisfied whether the Oversman had arrived at his conclusion on certain bases of valuation; and, assuming that he had done so, they contended that certain items had been charged for twice over. When hearing Counsel, the Oversman assured the parties that no one would require to pay twice over for any item in the accounts. The Gas Company also brought forward what they considered an arithmetical error in giving to the Corporation £11,048 of loose assets. They thought, from the way in which the award had been stated, that the Corporation might claim some part of this twice over; the difference being about £900. It was arranged that parties should sign a document, which the Oversman adjusted, acknowledging that the figures given in the proposed award applicable to loose assets were arrived at after deducting duties.

Yesterday, Mr. W. L. Macindoe, the Secretary of the Company, issued a circular to the shareholders, by order of the Board, in the following terms: "Lord Shaw, the Oversman, has now intimated his final award; the total price, including the whole assets of the Company whatsoever, being £137,150. The result of this award will be that a return of about £10 per share will be made to the shareholders. It is impossible at the present moment to make very definite calculation as to the exact figure. The accounts for the arbitration proceedings have still to be taxed; and it is inevitable that, as in all such cases, a considerable part of the expenses will be left for the Company to pay. Further, some questions of accounting have to be adjusted between the Corporation and the Company, as the arrangement in the arbitration was that the Corporation's entry was to be held as being at May 31, 1910, and that the Company were to carry on the undertaking since that date on behalf of the Corporation. The above-mentioned price fixed by Lord Shaw is the price for the whole assets as existing at May 31, 1910, and not the assets now existing. Out of the assets as existing at May 31, 1910, the Company have already paid two dividends; and the Company will also have to pay a considerable amount of expenses connected with the arbitration. It is expected that the principal sum awarded by Lord Shaw will be paid over by the Corporation about the end of May, although the expenses and other minor matters may take some time thereafter to adjust. With the view of facilitating the winding up of the concern, the Directors recommend that the Company be wound up, and that Mr. Macindoe, who has so long acted as Secretary, be appointed Liquidator. It is hoped that within a very short time after the receipt of the principal sum from the Corporation a division will be made among the shareholders of a very substantial sum, retaining only what is necessary to meet the various expenses that will fall to be paid by the Company, and any contingencies."

The Dunfermline Town Council on Monday considered the subject of the supply of gas to the burgh of Culross. The Gas Committee reported that they had had before them a provisional estimate by the Engineer and Manager—Mr. A. Waddell—in which it was stated that the cost of laying a 5-inch high-pressure pipe to Culross, 13,457 yards, would be £4037, and that the Committee had decided to ask for powers to complete their negotiations with the burgh for the supply. Mr. T. Stewart, the Convener of the Gas Committee, in moving the adoption of the minute, stated that the people in the intervening village of Torryburn were taking steps for the formation of a special lighting district, which made the matter more urgent than it would otherwise be. Replying to Treasurer Harley, Mr. Waddell said that they had been running for a few years without any margin in retorting capacity; but when the new retorts were all provided, this would be ample. The holder capacity would be sufficient for some years to come; and when the Naval Base district developed, the storage could be increased cheaply. In the course of discussion, it was stated that the price of gas was to be the same in Culross as in Limekilns and Charlestown. The minute was adopted, authorizing the work to be proceeded with.

A special article, entitled "Gas-Fires—Economy and Convenience," written by Mr. W. M. Mason, of the Glasgow Corporation Gas Office, was published in the "Glasgow Herald" on Tuesday. After dealing with the economy and convenience of gaseous fuel, the article concludes with the passage: "Some gas undertakings find it good business to give their customers gas-fires on hire, and some even lend them free of all charge. The Glasgow Corporation have hardly reached this generous stage; but the day may not be very far off when there will be both free cookers and free fires for all consumers of smokeless fuel."

The Edinburgh and Leith Gas Commissioners, at their monthly meeting on Monday, had before them the contracts for the coal required during the forthcoming year. The subject was considered in private; and in public meeting it was intimated that contracts had been entered into for 172,000 tons. The quantity, it was stated, is from 25,000 to 30,000 tons less than was contracted for a year ago. The price is also less; but by how much was not stated.

The Arbroath Town Council last week agreed to contracts being entered into for the supply of 10,000 tons of coal for next year. The result of the whole tenders, it was explained, was an average reduction in the price of about 3½d. per ton, which over the year will amount to some £150. In the minutes of the Gas Committee, it was stated that the Manager reminded the Committee that a considerable time ago he was asked to report on the advantages of machine stoking, and that he then advised that there did not appear to be anything to be gained by the adoption of stoking machinery. In view, however, of the developments that had since taken place in the carbonizing section of gas-works operations, he asked the Committee to consider whether further inquiry should now be made. It was agreed that the Manager—Mr. A. C. Young—should visit some of the works where new methods of carbonization are to be seen.

The Gas Committee of the Grangemouth Town Council reported on Monday that, in terms of a remit from the Council, the Gas Manager (Mr. C. Winton) had reported on the question of the supplying of slot-meter consumers with cookers rent free, and the minimum gas consumption to justify the concession. The Manager quoted a minimum consumption of 7000 cubic feet as justifying the fixing of a free cooker; and he was confident that this would lead to an increase in the sale of gas. A consumption of 12,800 cubic feet per annum represented an expenditure of only 1s. per week. At present, they had 770 slot-meters: but of these only 125 were used along with cookers. With regard to supplying gas-rings free, he found these could be provided at a cost of from 3s. 6d. to 4s., including fixing; and they were known, in many cases, to consume as much gas as a cooker. The Council agreed to adopt the report of the Manager so far as regarded the supplying of gas-rings only.

Testing Cambridge Gas.—At the meeting of the Cambridge Town Council last Wednesday, it was decided, on the recommendation of the Paving, Drainage, and Lighting Committee, to appoint a gas tester, who, on the suggestion of Dr. Frank Clowes, will test the gas not only for illuminating power, ammonia, and sulphuretted hydrogen, but at least once a week for sulphur in any form and for calorific power. A complete analysis of the gas is to be made at least once a month.

Richmond Water Supply.—The Water Committee of the Richmond (Surrey) Town Council recently reported that the Borough Accountant had submitted to them a statement showing the total expenditure on the Petersham filter-beds and works in connection therewith. The estimate amounted to £5185, and the total expenditure has worked out at £5000. The Committee were of opinion that this result was very satisfactory; and they expressed their thanks to the Water Engineer (Mr. W. G. Peirce) and his assistant for the capable manner in which they had supervised the carrying out of the works. The Medical Officer of Health had made frequent inspections of the filter-beds, and had analyzed the filtered water each week; and the analyses showed the water to be of excellent quality.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 250.]

LIVERPOOL, *April* 22.

Sulphate of Ammonia.

Owing to the fact of some requirements for April delivery having been left uncovered until after the holidays, the market has not been so slow as is frequently the case at Easter, and values have been about maintained at the level reached last week. There are now buyers for prompt delivery at £13 12s. 6d. per ton f.o.b. Hull, £13 13s. 9d. per ton f.o.b. Liverpool, and £13 16s. 3d. per ton f.o.b. Leith; but they will not pay these prices for May shipment. Farther ahead, the only sale by manufacturers that has transpired is for May-October in equal monthly quantities at 5s. per ton below the present price for prompt delivery.

Nitrate of Soda.

The tone of this market continues without alteration, and quotations are repeated at 9s. 9d. per cwt. for ordinary and 10s. for refined quality, on spot.

LONDON, *April* 24.

Tar Products.

The markets for tar products have been quiet during the past week. In pitch, there has been a little more inquiry from nearly all quarters; and it appears that consumers have still more to buy for this season's delivery. Benzols are exceedingly quiet. Solvent naphtha is steady; but prices do not alter. Heavy naphtha is in fair demand. Creosote is quiet, although prices remain firm.

The average values during the week were: Tar, 17s. 9d. to 21s. 9d. *ex* works. Pitch, London, 36s. to 36s. 6d.; east coast, 35s. 6d. to 36s.; west coast, Manchester, 35s. 6d. to 36s., Liverpool, 36s. to 36s. 6d., Clyde, 36s. to 36s. 6d. Benzol, 90 per cent., casks included, London, 8¾d. to 9¼d.; North, 8½d. to 9d.; 50-90 per cent., casks included, London, 9d. to 9½d.; North, 8½d. to 9d. Toluol, casks included, London, 9⅜d.; North, 9¼d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3¾d. to 3¾d.; solvent naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11d.; heavy naphtha, casks included, London, 1s. to 1s. 0½d.; North, 10½d. to 11d. Creosote, in bulk, London, 2¼d. to 2⅜d.; North, 1¾d. to 2d. Heavy oils, in bulk, 2⅜d. to 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 7d. to 1s. 8d.; west coast, 1s. 6½d. to 1s. 7½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been a little more inquiry for this article, which has had the effect of steadying the price at nearly all ports. Actual Beckton is quoted £13 5s. Outside London makes, 25 per cent., are £13 2s. 6d.; Hull, £13 15s. to £13 16s. 3d.; Liverpool, £13 15s. to £13 16s. 3d.; Leith, £13 17s. 6d.; and Middlesbrough, £13 15s.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now a stronger demand for coal in the North; for not only have stocks to be made up that were reduced in the holidays, but the opening of the Baltic increases the business from the northern ports. In the steam coal trade, best Northumbrians are from 10s. 9d. to 10s. 10½d. per ton f.o.b. For second-class steams, from 9s. per ton is quoted; and for steam smalls, from 5s. to 6s. 3d. In gas coals, there is now a full production at the collieries; and, on the whole, it is well taken up—the increase in the exports making up for the fall which in the home consumption becomes more noticeable as the days lengthen. Durham gas coals vary from 8s. 9d. to 9s. 6d. per ton f.o.b. for the usual classes, according to quality; while for "Wear" specials, 10s. 6d. to 10s. 9d. is the current quotation. There are no very important contracts for gas coals to report; but deliveries on some of those that have been entered on to the Baltic will soon begin, for some shipments to Cronstadt are expected within a week. Cargoes are being also sold to some of the Mediterranean ports at prices that are near those that are current. It is believed that the exports of gas coals from the Durham ports will be heavier this year than last. Coke is steady. Good gas coke is now in rather more limited output, and is quoted from 12s. 10d. to 13s. 3d. per ton f.o.b. on the Tyne or Wear.

Scotch Coal Trade.

The market is far from satisfactory; the shipping demand being still the greater disappointment. The home demand is, however, not very strong. Only small stuffs are in request. The prices now quoted are: Ell, 8s. 9d. to 9s. 9d. per ton f.o.b. Glasgow; splint, 9s. 3d. to 9s. 6d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 330,078 tons—an increase of 25,837 tons upon the previous week, and of 13,786 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,234,579 tons—a decrease upon the corresponding period of 164,713 tons.

Rural District Councils and the Cost of Tarring Roads.—Rural district councils, who have hitherto been prohibited by the Local Government Board from making payments towards the cost of tarring roads to overcome the dust nuisance, are, it appears, to be allowed a little more freedom in the matter. Speaking on Monday last week at a meeting of the Lindfield (Sussex) Parish Council, Mr. G. C. Hawes, a member of the East Sussex County Council, said he had interviewed the Local Government Board officials, who had suggested that county councils and rural district councils should come to an agreement that tar-spraying was a road improvement. This would enable the latter councils to contribute towards the cost, and make it a general or special charge on the parishes under the Highways Act of 1890. A member of the Council stated that for every £100 spent on tar, £300 was saved in stone, as well as the cost of watering the roads.

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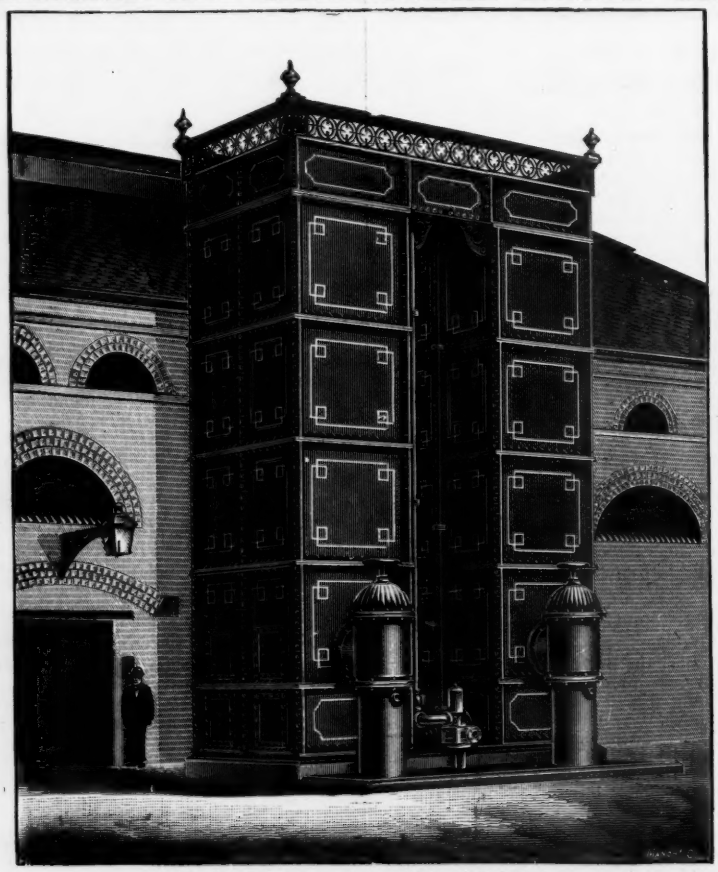

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BRISTOL,
WALKER AND WALLSEND,
and other Works.

Hot-Water Work and Boiler Connections.

A discourse on the subject of hot-water work was delivered last Thursday, by Mr. Frederick Dye (on behalf of Messrs. John Wright and Co., Limited) to the staff of the Staines and Egham Gas Company. Mr. Dye remarked that when connecting the circulating pipes of a hot-water apparatus to the boiler it is the invariable rule to connect the two pipes at different levels—one high and the other low, one at the extreme top of the boiler and the other near the bottom. This is common knowledge; yet how many know why the connections are so arranged? The most general impression is that the high and low connections bring about the circulation—some going so far as to say that they create the circulation, while others consider the practice more or less necessary to the existence of the circulatory movement. Yet if the two pipes are both connected quite level at the top of the boiler, a circulation is obtained just as soon and quite as active as when the pipes are at different levels. In other words, the pipes may just as well be level with one another as at different levels, so far as the production, strength, or swiftness of the circulation is concerned; and the high and low connections are used solely for a different purpose—viz., to ensure that the circulation shall occur in the desired direction. In all these works, one of the pipes has to be a recognized "flow" pipe, up which the heated water ascends, while the other has to be the "return" pipe, down which the corresponding volume of cold or cool water, descends; and if the pipe connections are level in the boiler, it is not, as a rule, possible to say which will be the flow and which the return pipe until after the fire is lighted. This, remarked Mr. Dye, would make a man uncertain, to say the least, while progressing with his work; whereas by adopting the high and low connections, he knows which will be the flow and which the return pipe. The pipe from the high connection will be the former; the lower one the latter.

Bombay Gas Company, Limited.—At a general meeting of this Company on the 11th prox., the Directors will report a further increase in the sale of gas in the past year to the extent of 11·9 per cent., of which private consumers yielded an increase of 14·2 per cent. and public lamps of 8·7 per cent. In addition to the reduction of 4 annas in the price of gas mentioned in the report for the year 1909, the Directors have made a further similar reduction as from the 1st of January last. They have decided that, for the purpose of providing the requisite funds to meet the expenditure on the additional works and mains rendered necessary by the development of the Company's business, it is expedient to raise additional capital. The profit for the year, after allowing for interest and exchange, amounts to £18,458; making, with £4384 brought forward, £22,842 available for distribution. After allowing for the interim dividend paid in December last (£7200), and placing £685 to the reserve fund, there remains £14,957, out of which the Directors recommend a dividend of 4 per cent., free of income-tax; making 7 per cent. for the year. This will leave £5357 to be carried forward.

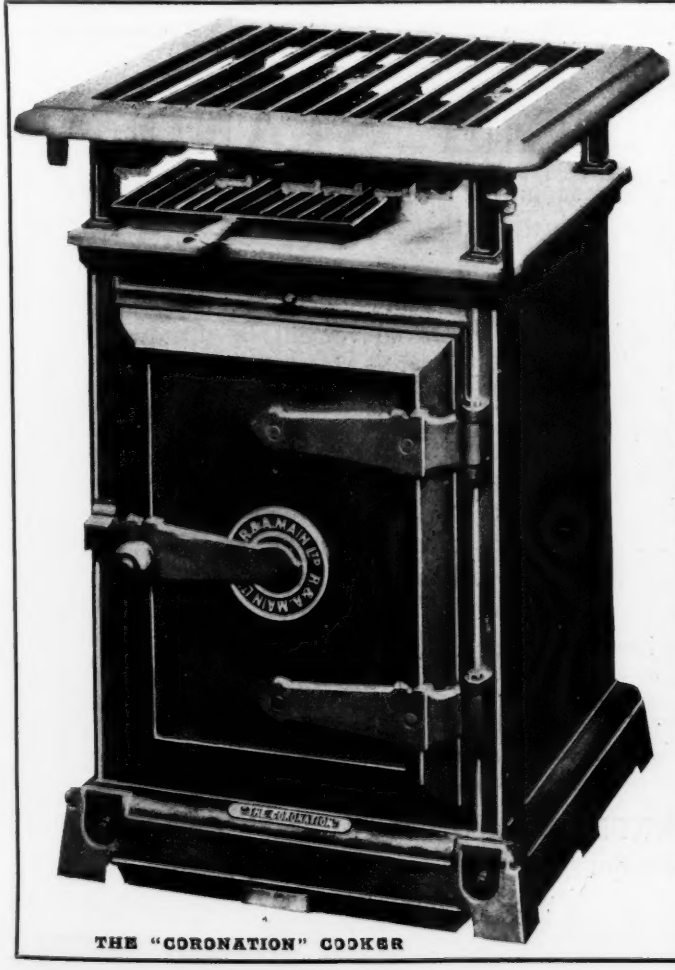
The Scarcity of Coke.

At a meeting of the Oldham Gas Committee, the General Manager (Mr. Arthur Andrew) remarked that the stock of coke was very low, and they had been compelled to stop the supply to local consumers, except contractors. He added that the scarcity of coke was not confined to Oldham, but was general throughout the country. He had tried to obtain coke from other places, but had only been able to get six or seven waggons. It had been quite an exceptional period. Several members stated also that they had never known a time before when there was such a shortage. A somewhat similar condition of affairs was referred to at the annual meeting of the Halifax Central Ward Liberal Committee, when Mr. Whitaker complained of the shortage of coke in the borough, and expressed the opinion that there should be some stipulation that, before outsiders were supplied, the needs of the ratepayers should be met. Councillor Seed, alluding to this matter, said he understood the price of coke had been put up in order to discourage the outsiders from buying.

Reduction in the Price of Gas in Liverpool.—It may be remembered that, in connection with the settlement of certain differences which had arisen between the Liverpool Corporation and the Gas Company, an agreement was come to which contained a provision for a reduction in the price of gas to the extent of 2d. per 1000 cubic feet as from the 31st ult. In accordance with this agreement, official intimation has been given by the Company to the Corporation that, commencing with the present quarter, the price of gas will be 2s. 3d. per 1000 cubic feet. The reduction is to remain in force for two years, subject, however, to the price of coal.

Meter-Testing at Newcastle.—In his report with reference to the testing of meters, the Chief Inspector of Gas-Meters to the Newcastle-on-Tyne Corporation, states that the total number of meters tested and stamped during the past five years has been 8305; and the testing and stamping fees amounted to £356. The number tested for certificates was 2319, of which 947 were found correct, and 1372 incorrect. Of the latter, 557 were fast, 517 slow, and 298 would not register. The 557 meters found fast ranged from 2 to 37·05 per cent.; and the average percentage was 5·02. The 517 meters found slow ranged from 3 to 57·26 per cent.; and the average percentage was 13·60.

Price of Gas at Rhyl.—Presenting the annual statement of accounts to the Rhyl Urban District Council, the Chairman of the Finance Committee (Mr. H. A. Tilby) said that the Gas Committee had kept up their progress by a profit of £2371—the largest ever made. This was a temptation to some to argue for a reduction of price; but he hoped nothing of the kind would take place. The price of gas in Rhyl was 1s. per 1000 cubic feet less than the average of all Flintshire gas concerns. A reduction of 1d. per 1000 cubic feet would entail a loss of £225, which would mean an increase of 1d. in the rate. A reduction in the price of gas would also mean retarding the progress of the electric light undertaking, which had been a losing concern.



THE "CORONATION" COOKER

"CORONATION" CHARACTERISTICS

The "Coronation" Cooker represents the very latest phase of Cooker evolution. Every part combines strength and convenience.

BEAUTIFULLY ENAMELLED.

R. & A. MAIN, LTD.,

WORKS: Gothic Works, EDMONTON, N.; and Gothic Iron-Works, FALKIRK.

SHOW-ROOMS: 25, Princes Street, Oxford Circus, W.
136, Renfield Street, GLASGOW;
56, Broad Street, BIRMINGHAM;
83, Old Market Street, BRISTOL;
13, Whitworth St. West, MANCHESTER;
and 333, Queen Street, MELBOURNE.

Additional Capital for the Merthyr Tydfil Gas Company.—It will be seen, from an announcement which is appearing in our advertisement columns, that the Directors of the Merthyr Tydfil Gas Company are inviting tenders for an issue of £10,000 of 5 per cent. consolidated ordinary stock, subject to the sliding-scale. As the Company have paid maximum dividends on their ordinary stock for the past 43 years, the value of the stock as an investment does not need emphasizing.

Electric Light Failures in Churches.—When presiding at the Vestry meeting at the church of St. John the Baptist, Newport (Mon.), last Wednesday, the Vicar (Rev. J. Frank Summers) said he had a suggestion to bring forward. As all present were aware, St. Woolos Church a short time ago was within an ace of an awkward and dangerous accident through the failure of the electric light [see *ante*, p. 126]. On one occasion the light failed them in their church; but they were not left absolutely in darkness, owing to the candles. It seemed to him that they ought to guard against anything of the kind, especially as the exits were not very good. If there was a panic, it would be most awkward. He suggested they should ask the Parish Warden (Mr. Leadbeter) to write to the Gas Company, inquiring the cost of laying on the gas to the church, and putting in certain burners near the doors and elsewhere. Mr. Leadbeter said he had written to the authorities twice with reference to the electric light; but they did not seem to take any notice of his letters. Several present made strong complaints of the poor light in the aisles of the church. Ultimately Mr. Leadbeter was asked to write to the Gas Company and inquire the cost of carrying out the Vicar's suggestion.

South Barracas (Buenos Ayres) Gas and Coke Company, Limited.—In the report to be presented at the meeting of this Company to-day, the Directors state that the trading profit for last year amounted to £3256, which, with £14,956 profit other than trading and £6088 brought forward, makes an available total of £24,301. After placing £5000 to a reserve fund, the Directors recommend a dividend at the rate of 4 per cent. per annum, free of income-tax (of which 2 per cent. was distributed as an interim dividend in October last), and a bonus of 1 per cent., free of income-tax, upon the issued capital of the Company. This will absorb £8333; leaving £10,968 to be carried forward. The Directors desire to point out that 1910 is the first year that the Company has been worked independently. This is consequent upon the amalgamation of the Buenos Ayres (New) Gas Company with the other Gas Companies of the city. So long as this Company was owned and managed by the Buenos Ayres (New) Gas Company, the latter was able to assist the Company in many ways which now no longer exist. Under the altered circumstances, a new staff and offices had to be arranged, and administration charges incurred over what they were under the old *régime*. The greatly increased cost of coal and freight also unfavourably affected the results of the year. On the other hand, the total output of gas in 1910 exceeded that of 1909 by nearly 4 million cubic feet. The districts served by the Company are extensive, and are being rapidly developed.

Lyttelton (N.Z.) Corporation Gas Undertaking.—At a recent meeting of the Lyttelton (N.Z.) Borough Council, a report was received from the Gas Committee, recommending that the sum of £200 (being the sum set apart on the estimates approved by the Council as the contribution to the gas-works loan sinking fund) should be paid over to the Commissioners for investment. The Committee had considered the financial position of the Gas Department for the current year, and found that the receipts from the sale of gas had been well maintained. The Council were therefore advised to agree to a further reduction in the price of gas for lighting purposes to 5s. 10d. per 1000 cubic feet net, from the 1st of April, thus making the price of gas uniform for all purposes. This concession represents £180 per annum. The report was unanimously adopted; great satisfaction being expressed by several councillors at the sound financial position of the gas undertaking, and at the reduction in the price of gas from 10s. to 5s. 10d. per 1000 feet since the works were acquired by the Council 8½ years ago.

Abstraction of Water from the Dee.—In connection with the Bill of the Chester Water Company, which has lately been before a Select Committee of the House of Lords, the Board of Trade made a report to Parliament calling attention to the possible injury to the navigation of the tidal portion of the River Dee by an increased abstraction of water. In the report, which has recently been issued, it is pointed out that when the Birkenhead Corporation promoted a Bill in 1907 for taking water from certain tributaries of the Dee, the Board of Trade asked Mr. L. F. Vernon Harcourt to report on the subject. His conclusions were that any abstraction of fresh water would be injurious to the tidal portion of the river in proportion to the amount drawn; and that dredging would be a remedy. In the Birkenhead Bill, a clause was inserted by which the Corporation paid to the Conservancy Board a lump sum to cover the cost of dredging. The Board of Trade considered it right to call the attention of Parliament to what took place when it was previously proposed to authorize the taking of water from the Dee.

Working of Industrial Co-Partnerships.—In answer to a question put to him on this subject by Viscount Wolmer, the President of the Board of Trade (Mr. Sydney Buxton) last Tuesday made a written reply, in the course of which he stated that the Board published a report on profit-sharing in 1894; and the information given therein had been kept up to date by a series of annual articles in the "Board of Trade Labour Gazette." A companion volume, dealing with gain-sharing and certain other systems of bonus on production, was issued in 1895. These volumes mainly relate to the United Kingdom. Another report issued by the Board in 1896 dealt with "Contracts given out by Public Authorities to Associations of Workmen" in this and other countries. No Foreign Government had, so far as was known to the Board of Trade, issued a report on any of these subjects; but the French Society for the study of Profit-Sharing (La Société pour l'Etude Pratique de la Participation du Personnel dans les Bénéfices) published a quarterly bulletin containing information with regard to schemes of this nature in various countries.

A FIRM STAND

can be made and a Solid Foundation maintained by adopting this unique accessory to the Gas Cooker.

The distinctive advantage of this New Adjustable Stand is the convenient height at which a stove can be set by simply raising or lowering the legs, giving greater ease when using the oven, and no encroachment on cooking space.

The Stand is of cast iron, with a top of White Porcellanite Enamel, thoroughly hygienic, and greatly improves the appearance of any Cooker.

It is suitable for all medium sizes, and will be a necessary adjunct to the Cooker of the future.

Lists and Particulars on Application.

THE RICHMOND GAS STOVE & METER CO., LTD.

132, QUEEN VICTORIA STREET, LONDON, E.C.

Works: WARRINGTON.

The accounts of the Heywood Corporation Electricity Department for the past year show a deficiency of £2044; and the Town Council have decided to ask the Finance Committee for a sum equal to a rate of 2d. in the pound to meet it.

We have received from the Lead Wool Company, Limited, of Snodland, a copy of their new pamphlet containing photographs of mains jointed by means of lead wool. The sections relating to gas and water mains are those in which "JOURNAL" readers are specially interested; and in connection with these they will find lists of cases where the material named has been used in both high-pressure and ordinary gas-mains, and where joints made with it have been specified for water-mains.

A Coroner's Jury returned a verdict of "Death from accidental gas poisoning," in the case of Charles Bristow (aged 71), a retired musician, who lived with his son-in-law at Leyton. Deceased was found dead on a chair in the kitchen; the tap of the boiling-ring on the gas-stove near by being turned on, and the gas not lighted. At his feet was an empty bowl, and on the stove a kettleful of water. The son-in-law said it seemed as if Bristow had put the kettle on, and after turning on the tap forgot to light the gas, and went back to his chair to read the paper.

Messrs. Joseph Taylor and Co. have received orders for solid plate lead saturators, including the whole of the leadwork, for the new sulphate of ammonia plants at the works of the Accrington Gas and Water Board, Forfar Gas Commissioners, Hathersage Gas Company, and the Middleton Corporation Gas Department; also repeat orders for two similar saturators for Melbourne, under instructions from Messrs. John Terry and Co. Further orders have been received from the Llanelly and Abingdon Gas Companies, and from Messrs. J. Turner and Co., Queen's Ferry.

An extensive installation of cooking apparatus has been specially designed for the new Young Men's Christian Association, Manchester, by the Richmond Gas Stove and Meter Company, Limited. The suite consists of one four-oven combination cooking-range, large gas-grillers and boiling-pans, stock pots, special battery of steaming chambers, carving-tables, hot closets, boilers, potato-peelers, &c. The whole has been fitted up on the latest and most approved methods compatible with economy and location; and it is considered to be one of the finest installations of its kind in the North of England.

The Directors of Messrs. Newton, Chambers, and Co., Limited, report for the year ended Dec. 31 that, after allowing for depreciation, the profit and loss account shows a profit for the year of £32,331; making, with the balance of £15,709 brought forward, a total of £48,040. Out of this there has been paid £3304 to the holders of debenture bonds and the mortgagees for interest; leaving an available balance of £44,736, which the Directors recommend to be applied as follows: Transfer to reserve fund, £10,000; 6 per cent. on the preference shares, £8817; a like amount on the ordinary shares, £9570—carrying forward a balance of £16,349.

An order for five beds of eighteen Dessau retorts, 5 metres long—90 retorts in all—has just been arranged for the Pforzheim (Germany) Gas-Works.

The Plaissetty Manufacturing Company, manufacturers of incandescent gas-mantles, of Parkfield Works, Leyton, has been registered as a limited partnership from the 31st ult., and to continue so long as the business is carried on.

The Directors of the Oriental Gas Company, Limited, have resolved to pay an interim dividend at the rate of 3½ per cent., free of income-tax, on account of the year ending the 30th of June next. This is at the same rate as last year.

Messrs. J. & W. B. Smith, of Farringdon Road, send a price list which they are just issuing of glass bead shades for inverted gas-fittings. It is accompanied by a sheet containing sixteen designs of shades, showing the patterns of the beads in their actual colours; and they are very effective.

The Works Committee of the Deptford Borough Council have had under consideration the desirability of the Council undertaking the reinstatement of the roads and footways of the borough after the opening of them by companies and persons having statutory rights to do this, instead of permitting them, according to the present practice, to do the work themselves. Under the provisions of the Metropolis Management Acts, a local authority can reinstate the surface of a road broken up; and the Committee have decided that it would be more satisfactory for the Council to do it than to permit the companies to carry out the work. They will try the experiment for one year from the 1st of October next.

APPLICATIONS FOR LETTERS PATENT.

8835.—GREEN, H. J., "Gas-producers." April 10.
8882.—SCHMIDT, G. F., "Gas-generator." April 10.
8941.—JOEL, W. C., "Flashing gas-signs." April 10.
8942.—DELAUNAY, H. M., "Process of, and apparatus for, illuminating by means of gas." April 10.
8963.—ADAMS, A. & M. J., "Gas-fires." April 11.
8986.—WINSTANLEY, T., "Manufacture of ammonia and its salts." April 11.
9085.—SMITH, J., "Combined steam-generator, steam-superheater, and gas-producer." April 12.
9099.—WILSON, A., "Gas-producers." April 12.
9151.—WILSON, G., "Gas-governors." April 12.
9202.—SUTHERLAND, J. G., & A. G., "Gas-governors." April 13.
9209.—BONE, W. A., WILSON, J. W., and M'COURT, C. D., "Combustion of gaseous or gasified fuel." April 13.
9211.—FORBES, T. S., "Generation of gas from petrol." April 13.
9358.—BEIMANN, W., "Production of liquor containing ammonium chloride in the carbonization of coal or the like." April 15.

SUPPLY AND DEMAND.

Gas Engineers
DEMAND
Perfection
IN
Cooker
Construction.

PARKINSON'S
SUPPLY
IT IN
Their
Latest
Pattern.

ALL PARTS
STANDARDIZED.

THE PARKINSON STOVE CO., LTD.
BIRMINGHAM AND LONDON.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

LADY INSTRUCTORS IN GAS COOKING, &c. No. 5386.
WORKS MANAGER OR FOREMAN. No. 5388.
FOREMAN GAS FITTER. 5383.
WORKING FOREMAN (Tar-Works). No. 5385.
JUNIOR CLERK. Shotley Bridge and Consett Gas Company.
CLERK. No. 5384.
LEAKAGE DETECTOR, &c. No. 5376.
SHOP MANAGER (to Take Charge of Gas-Works). Ordnance Factory, Woolwich Arsenal.

Situations, &c., Wanted.

MANAGER OR MANAGING-DIRECTOR. Box 441, T. B. Browne's Advertising Offices.
WORKS OR CARBONIZING FOREMAN. No. 5387.
SULPHATE PLANT REPAIRER, &c. Davies, Shepherd's Bush.

Plant, &c. (Second-Hand), For Sale.

EXHAUSTER, ENGINE, &c., Blythe and Cowpen Gas Company.
ROVER CAR. South Bank Gas Works.

Stocks and Shares.

EAST GRINSTEAD GAS AND WATER COMPANY. By Auction. May 9.
ILFRACOMBE GAS COMPANY. By Tender. May 15.
MAIDSTONE GAS COMPANY. By Auction. May 9.
MERTHYR TYDFIL GAS COMPANY. By Tender. May 11.
SOUTHEND WATER-WORKS COMPANY. By Auction. May 9.
SOUTHGATE GAS COMPANY. By Auction. May 9.
TENDRING HUNDRED WATER COMPANY. By Auction. May 9.

Meeting.

BOMBAY GAS COMPANY. London Offices. May 11. Twelve o'clock.

TENDERS FOR

Coal and Cannel.

BARNOLDSWICK URBAN DISTRICT COUNCIL. Tenders by May 1.
BARROW-IN-FURNESS CORPORATION. Tenders by May 2.
CONGLETON GAS COMMITTEE. Tenders by May 6.
DEVONPORT GAS DEPARTMENT. Tenders by May 6.
EAST DEREHAM URBAN DISTRICT COUNCIL. Tenders by June 5.
EASTBOURNE GAS COMPANY. Tenders by May 2.
ELSECAR, WENTWORTH, AND HOYLAND GAS COMPANY. Tenders by May 10.
ROCHESTER, CHATHAM, AND GILLINGHAM GAS COMPANY. Tenders by May 3.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending April 22. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar crude	per ton	—	18/6 21/6	18/6 22/-	18/6 21/-	18/6 21/-	—
Pitch	,,	37/6	35/6 36/-	35/9	36/-	35/- 35/6	35/6
Benzol, 90%	per gallon	-/10 -/10½	-/9	-/9	-/9¼	-/9	-/9
Benzol, 50-90%	,,	—	-/9¼ -/9½	-/9½	-/8¼	-/8⅜	—
Toluol, 90%	,,	—	-/9¼ -/10	-/10	-/10	-/10	-/10
Crude naphtha, 30%	,,	—	-/3⅜	-/4	-/3⅜	-/3½	—
Light oil, 50%	,,	—	-/3½	-/3⅜ -/4	-/3½	-/3¼ -/3⅜	—
Solvent naphtha, 90-160	,,	1/-	-/10½	-/10	-/10	-/10½	-/11
Heavy naphtha, 90-190	,,	—	-/11	-/11½	-/11¼	-/11¼	-/11
Creosote in bulk	,,	-/2½	-/2½	-/2	-/2⅛	-/2⅛	-/1⅞
Heavy oils	,,	—	-/2¾	-/2¼	-/2¾	-/2⅝	-/2⅝
Carbolic Acid, 60's	,,	1/8½	1/7 1/7½	1/7	1/7	1/7¼	1/8½
Naphthalene, crude drained salts	per ton	—	42/6 45/-	40/- 42/6	47/6	47/6 50/-	—
,, pressed	,,	—	60/-	63/-	60/-	60/- 72/6	—
,, whizzed	,,	—	—	—	70/- 72/6	65/- 75/-	63/-
Anthracene	per unit	-/2	-/1⅛	-/1½	-/1¼	-/1¼	—

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 218.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	83—86*	+2	5 16 3	4,940,000	Stk.	Nov. 11	9	Imperial Continental .	191—193	..	4 13 3
374,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	95—97	..	4 2 6	1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92—94	..	3 14 6
200,000	5	Oct. 28	7	Bombay, Ltd. . . .	6¾—7	..	5 0 0	200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c. .	119—121	..	4 19 2
40,000	5	,,	7	Do. New, £4 paid .	5⅞—6	+¼	4 13 4	561,000	Stk.	Feb. 24	10	Liverpool United A. .	214—216	..	4 12 7
50,000	10	Feb. 24	15	Bourne- } 10 p.c. .	28—29	..	5 3 5	718,100	,,	,,	7	Do. B. .	163—165	+½	4 4 10
311,810	10	,,	7	mouth Gas } B 7 p.c. .	16—16½	..	4 4 10	306,083	,,	Dec. 30	4	Do. Deb. Stk.	102½—104½	..	3 16 7
75,000	10	,,	6	and Water } Pref. 6 p.c.	14½—15	..	4 0 0	75,000	5	Dec. 15	6	Malta & Mediterranean	4⅝—5	..	6 0 0
383,000	Stk.	,,	12½	Brentford Consolidated	254—257	..	4 18 3	560,030	100	Apl. 1	5	Met. of } 5 p.c. Deb.	100—102	..	4 18 0
330,000	,,	,,	9½	Do. New . . .	197—200	..	4 15 0	250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	100—102	..	4 8 3
50,000	,,	,,	5	Do. 5 p.c. Pref. .	122—124	..	4 0 8	541,920	20	Nov. 11	3½	Monte Video, Ltd. . .	13—13½	..	5 3 8
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb. .	98—100	..	4 0 0	1,775,892	Stk.	Feb. 24	4½	Newc'tle&G'tesh'd Con.	101—103	+1	4 5 0
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	215—218	..	5 0 11	529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	89—90	..	3 17 9
246,320	,,	,,	8	Do. A Ord. Stk. .	155—158	..	5 1 3	55,940	10	Mar. 10	7	North Middlesex 7 p.c.	14½—15½	..	4 10 4
460,000	20	Apl. 12	10½	British	43¼—44½*	..	4 15 4	300,000	Stk.	Nov. 30	8	Oriental, Ltd. . . .	13⅝—14¼	..	5 13 6
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	96—98	..	4 1 8	60,000	5	Apl. 12	8	Ottoman, Ltd. . . .	6¾—7¼*	..	5 10 4
109,000	,,	Feb. 10	6	Bromley, A 5 p.c. . .	116—118	..	5 1 8	31,800	53	Feb. 24	13	Portsea Island A . . .	135—140	..	4 18 4
165,700	,,	,,	4½	Do. B 3½ p.c. . .	87—89	..	5 1 2	60,000	50	,,	13	Do. B . . .	125—130	..	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c. . .	106—108	..	5 1 10	100,000	50	,,	12	Do. C . . .	120—125	..	4 16 0
55,000	,,	Dec. 30	3½	Do. 3½ p.c. Deb. .	84—86	..	4 1 5	114,800	50	,,	10	Do. D and E.	102—105	..	4 15 3
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	96—98	..	4 1 8	398,490	5	Oct. 28	7	Primitiva Ord. . . .	7⅛—8	..	4 7 6
100,000	10	—	—	Cape Town & Dis., Ltd.	3¾—4¼	..	—	796,980	5	Dec. 30	5	Do. 5 p.c. Pref. .	5¼—5½	..	4 10 11
100,000	10	—	—	Do. 4½ p.c. Pref. .	6—6½	..	—	488,900	100	Dec. 1	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—	312,650	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	96—98	..	4 1 8
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	88—90	..	5 0 0	250,000	10	Mar. 24	9	San Paulo, Ltd. . . .	15⅞—16¼	+¼	5 10 9
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord. . .	109—111	..	4 10 1	115,000	10	,,	6	Do. 6 p.c. Pref. .	11⅛—12	..	5 0 0
1,513,280	Stk.	,,	5 9/4	Commercial 4 p.c. Stk.	113—116	..	4 14 3	125,000	50	Jan. 3	5	Do. 5 p.c. Deb. .	50—51	..	4 18 0
560,000	,,	,,	5½	Do. 3½ p.c. do..	108—110	..	4 16 11	135,000	Stk.	Mar. 24	10	Sheffield A	234—236	..	4 4 9
475,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	77—79	..	3 15 11	209,984	,,	,,	10	Do. B	234—236	..	4 4 9
800,000	Stk.	,,	4	Continental Union, Ltd.	95—97	..	4 2 6	523,500	,,	,,	10	Do. C	234—236	..	4 4 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	136—138	..	5 1 5	70,000	10	Oct. 14	6	South African . . .	10½—11	..	5 9 1
492,270	Stk.	—	5½	Derby Con. Stk. . . .	122—124	..	4 8 9	6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119—121	..	4 10 3
55,000	,,	—	4	Do. Deb. Stk. . . .	104—105	..	3 16 2	1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	79—81	..	3 14 1
148,995	,,	Apl. 12	5	East Hull 5 p.c. Ord. .	101—103*	..	4 17 1	209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	153—155	..	5 3 3
840,150	10	Jan. 27	10	European, Ltd. . . .	19½—20½	..	4 17 7	605,000	Stk.	Feb. 24	5¾	S'th Suburb'n Ord. 5 p.c.	119—121	..	4 13 6
16,179,445	Stk.	Feb. 24	4¾	Gas- } 4 p.c. Ord. . .	105½—106½	..	4 7 7	60,000	,,	,,	5	Do. 5 p.c. Pref. .	118—120	..	4 3 4
2,600,000	,,	,,	3½	light } 3½ p.c. max. .	85—87	..	4 0 6	117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
4,062,235	,,	,,	4	and } 4 p.c. Con. Pref.	101—103	..	3 17 8	502,310	Stk.	Nov. 11	5	Southampton Ord. . .	111—113	..	4 8 6
4,531,705	,,	Dec. 15	3	Coke } 3 p.c. Con. Deb.	79—81	..	3 14 1	120,000	Stk.	Feb. 10	7	Tottenham } A 5 p.c. .	141—143	..	4 17 11
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	92—94	..	5 6 5	483,940	,,	,,	5½	and } B 3½ p.c. .	115—117	..	4 14 0
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—	149,470	,,	Dec. 15	4	Edmonton } 4 p.c. Deb.	98—100	..	4 0 0
70,000	10	Oct. 14	11	Hongkong & China, Ltd.	17⅝—18	..	6 2 3	182,380	10	Dec. 30	8	Tuscan, Ltd.	9—9½	..	8 8 6
131,000	Stk.	Mar. 10	7½	Ilford A and C . . .	143—146	..	5 1 0	149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	98—100	..	5 0 0
65,780	,,	,,	5¼	Do. B	113—115	..	5 2 2	236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	112—113	..	4 8 6
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb. . . .	96—98	..	4 1 8	255,636	Stk.	Feb. 24	6⅞	Wands- } B 3½ p.c. . .	141—143	..	4 14 5
								85,766	,,	Dec. 30	3	worth } 3 p.c. Deb. Stk.	73—75	..	4 0 0

Prices marked * are "Ex. div."

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."
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All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, LONDON, E.C. "Volcanism, London."

TAR WANTED.
THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works, BRADFORD,
MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger
The one Machine which Discharges and Charges at One Stroke.
See Advertisement, April 11, p. II. of Centre.
ALDRIDGE AND RANKEN,
39, VICTORIA STREET, WESTMINSTER, S.W.
Telegrams: "MOTORPATHY, LONDON." Telephone: 5118 WESTMINSTER.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

ENQUIRIES SOLICITED.
FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS,
C. & W. WALKER, LIMITED,
DONNINGTON, NEWPORT, SALOP.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE)
ANY QUANTITY. ANY PORT. ANY STATION.
DONALD M'INTOSH,
110, CANNON STREET, LONDON.

DUTCH OXIDE OF IRON.
SPENT OXIDE PURCHASED IN ANY DISTRICT.
THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, SUTTON, SURREY,
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

COAL TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

AMMONIA.
Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d. "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: "SATURATORS, BOLTON." Telephone 0848.

IT is worth Your While to Buy Direct from the RELIANCE LUBRICATING OIL COMPANY GUARANTEED ANTI-CORROSIVE LUBRICANTS—viz., Motor Waggon Oil, 1s.; Motor Car Oil, 1s. 6d.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil, 10½d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.; 650 T Cylinder, 1s. 9d.; Special Engine Oil, 1s. 4d.; Gas Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.; Renown Engine Oil, 11½d.; and Astral Disinfectant, 2s. 6d. per gallon. Barrels free, carriage paid. Solidified Oil, 25s. cwt.
THE RELIANCE LUBRICATING OIL COMPANY, 19 & 20, Water Lane, Tower St., London, E.C. Agents wanted.

OXIDE OF IRON.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
"KLEENOFF," THE COOKER CLEANER.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.
SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.,
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, near LEEDS.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

SPENCER'S PATENT HURDLE GRIDS.
THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, April 4, p. 75.

GAS OILS.
MEADE-KING, ROBINSON, & CO., Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and TOWER BUILDING, 22, WATER STREET, LIVERPOOL.

BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

SULPHURIC ACID — Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two lines), Nos. 2420 and 2421.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

WANTED—Tar and Ammoniacal Liquor. Any Quantity.
GRINDLEY AND COMPANY, LIMITED, Rawcliffe, near Goole, YORKSHIRE.

"GUIDE to Patents, Trade Marks and DESIGNS," 1910. 4th Edition. Contains concise information on British, Colonial, and Foreign Patents, &c. All Inventors and those interested should send for free copy to J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, LONDON. 'Phone.: 480 HOLBORN. Telegrams: "Improvably, London."

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

AMMONIACAL Liquor wanted. Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.
Telegrams: "Chemicals."

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
John Radcliffe, Chemical Engineer, East Barnet.

TRAVELLER, No. 5361.

APPLICANTS for Position advertised under above number are THANKED, and Informed that the VACANCY HAS NOW BEEN FILLED.

WORKS' ASSISTANT AT WATERFORD.

APPLICANTS for above Position are THANKED and Informed that AN APPOINTMENT HAS BEEN MADE.

ENGINEERING ASSISTANT—No. 5370.

APPLICANTS for the Position ad-vertised under the above number are THANKED. The VACANCY HAS NOW BEEN FILLED.

SULPHATE of Ammonia Saturators and Lead Work (Repairs, &c.). Leadburner and Chemical Plumber of Great Experience. Workmanship Guaranteed. Disengaged. Any Distance, with or without Plant. Has worked for Principal Firms, with 20 Years' References. Erecting, &c.
Davies, 118, Galloway Road, Shepherd's Bush.

ADVERTISER, 10 years Managing- Director of Limited Company having earned four times its Capital, seeks MANAGING DIRECTORSHIP or MANAGERSHIP. Exceptional References.
Address, Box 441, T. B. Browne's Advertising Offices, 163, Queen Victoria Street, London.

SITUATION wanted as Works or Car-bonizing FOREMAN. Abstainer. References. Certificate. Used to all Plant, Machinery, Regenerators, Sulphate, Carburetted Water Gas, and to Economical Methods, and Taking Charge.
Address, No. 5387, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS COOKING.

LADIES required, of Good Address, thoroughly Experienced in Gas Cooking, to give INSTRUCTION AT CONSUMERS' HOUSES in the proper use of Gas Cookers.
Apply, by letter, giving full Informatien regarding Experience, Qualifications, and Salary required, to No. 5386, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, Works Manager or Fore-man for Gas-Works in South of England. Must have thorough practical knowledge of all Departments. Annual make, about 20 Millions. Regenerative Retorts. Sulphate of Ammonia Plant.
Applications, by letter, stating Salary required and previous Experience, with *copies* of Testimonials, to be sent to No. 5388, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, for a Large Tar-Works, a WORKING FOREMAN to TAKE CHARGE of Benzol and Naphtha Plant. Must be thoroughly acquainted with new Processes.
Apply, by letter, stating Qualifications, in strict Confidence, to No. 5385, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Foreman Gasfitter, well up in Latest Modern Fittings and Appliances, for a Town near Glasgow. Only First-Class Tradesmen of Good Address, able to interview Consumers, and with Experience in Dealing with Opposition from Electricity, need Apply. Liberal Terms to suitable Man.
Apply, by letter, with References, stating Age and present Salary, to No. 5383, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

A GAS Company near London, con-ducting a Considerable Business in Fitting Work, require a CLERK, who must have had actual Experience in Estimating and Making up Charges for Goods used and sold.
Apply, by letter, stating Age, Experience, and Salary required, to No. 5384, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Competent Shop Manager, to TAKE CHARGE of Gas-Works, with a daily output of about 1,000,000 cubic feet. Applicants should possess Educational Qualifications equivalent to the Examination for A.M. of Inst.C.E., and have had some Experience in Charge, after serving their time. Appointment for Three Years. Salary, £250 a Year, without Pension rights.
Apply, by letter, to the Chief Superintendent of Ordnance Factories, Royal Arsenal, Woolwich.

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY.

WANTED, at once, a Junior Clerk, about 21 Years of Age, with a knowledge of Gas Rental accounts, for General Office Work. Salary, 25s. per week. Applications, by letter, with References, &c., to be sent to
The Secretary.
Gas Offices, Shotley Bridge,
April 22, 1911.

DILIGENT, Persistent, and thoroughly Experienced Working Man required to Find and Stop Leaks in Gas Mains and Services.
Full Particulars (no Testimonials) to No. 5376, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE—A 20 H.P. Rover, in splendid condition, fitted with Hood, Screen, Five Lamps, Stepney, Parson Chains, Two Horns, only done 6000 to 8000. Car cannot be distinguished from new. Photo on Application.
Apply to Nixon, Gas-Works, South Bank, S. O. Yorkshire, or Mann and Egerton, Norwich.

OFFERS wanted for One (Waller) 3-Blade EXHAUSTER, with Engine and Valves complete. Capacity, 15,000 Cubic Feet per Hour. May be seen working at the Gas-Works, Blyth, Northumberland. Reason for Disposal being replacement by larger Machine. Further Particulars on Application.
Offers to be sent to the Secretary, Blyth and Cowpen Gas Company, Blyth, Northumberland.

BARNOLDSWICK URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for the Supply of 5500 Tons of Best Screened GAS COALS or NUTS, delivered free on Rail, Barnoldswick Station, between June 1, 1911, and May 31, 1912, in quantities as per Schedule.
The Council reserve the right to divide the quantity between two or more Contractors, and they do not bind themselves to accept the lowest or any Tender.
Form of Tender supplied on Application to the undersigned.
Tenders to be on the prescribed Forms and addressed to the Chairman, Gas Committee, Town Hall, Barnoldswick, and delivered not later than Monday, May 1, 1911.
J. W. Thompson,
Engineer and Manager.
Town Hall, Barnoldswick,
April 12, 1911.

COUNTY BOROUGH OF DEVONPORT.
(Gas Department.)

THE Gas Committee of the Devonport Corporation are prepared to receive TENDERS for the Supply of 25,000 Tons of GAS COAL, to be delivered in such quantities as may from time to time be determined previous to June 30, 1912.
The Coal is to be delivered c.i.f. at Tamar Wharf, Devonport.
Forms of Tender and Specification may be obtained from the undersigned.
The Committee reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, endorsed "Tender for Gas Coal," and addressed to R. J. Fittall, Esq., Town Clerk, Devonport, are to be delivered at the Town Clerk's Office on or before Saturday, May 6, 1911.
W. P. Tervet,
Engineer and Manager.
Gas-Works, Devonport.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF COAL AND CANNEL.

THE Corporation are prepared to re-ceive TENDERS, on Forms to be obtained at the Office of the Gas and Water-Works Manager, for the Supply of Screened GAS COAL and CANNEL for the Year ending the 30th of June, 1912.
Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office not later than Twelve o'clock noon on Tuesday, the 2nd of May, 1911.
The lowest or any Tender not necessarily accepted.
By order,
L. Hewlett,
Town Clerk.
Town Hall, Barrow-in-Furness.

EASTBOURNE GAS COMPANY.

THE Directors invite Tenders for the Supply of 30,000 Tons of GAS COAL, to be delivered at Eastbourne Railway Station during the Year commencing Sept. 1, 1911.
Forms of Tender and Specifications may be obtained from the undersigned.
All Tenders, sealed, and suitably endorsed, to be addressed to the Chairman, not later than May 2 prox.
(Signed) James S. Garrard,
Secretary.
10, Sussex Gardens.
Eastbourne.

BOROUGH OF CONGLETON.

THE Gas Committee are prepared to receive TENDERS for the Supply of GAS COAL or NUTS and CANNEL, for a period of One, Two, or Three Years, at the option of the Committee, commencing from July 1, 1911.
Tenders must be made on Forms (containing further Particulars) which may be obtained from the undersigned.
Sealed Tenders, endorsed "Gas Fuel," to be delivered to E. A. Plant, Esq., Town Clerk, Congleton, not later than Saturday, May 6, 1911.
The Committee do not bind themselves to accept the lowest or any Tender.
Joseph Broughton,
Engineer and Manager.
Gas-Works, Congleton,
April 19, 1911.

THE East Dereham Urban District Council are prepared to receive TENDERS for the Supply of about 1500 Tons of Screened GAS COAL or NUTS for the ensuing Year.
Particulars and Form of Tender to be had of the undersigned.
Tenders, marked "Coals," to be sent in by Ten a.m. on Monday, the 5th of June, 1911, to
B. H. Vores,
Clerk to the Urban District Council.
East Dereham, April 21, 1911.

THE Directors of the Elsecar, Went- worth, and Hoyland Gas Company invite TENDERS for the Supply of 3000 Tons (more or less) of Best Screened GAS COAL or NUTS, to be delivered at Elsecar (Great Central Railway) Station during the Year ending June 30, 1912, as required by the Manager.
No Tender Forms.
Tenders to be delivered by the 10th of May, addressed to the Chairman, 94, King Street, Hoyland, endorsed "Tender for Coal."
Albert F. Hall,
Secretary.
Hoyland, near Barnsley,
April 21, 1911.

ROCHESTER, CHATHAM, AND GILLINGHAM GAS COMPANY.

GAS COAL.

THE Directors invite Tenders for the Supply of 30,000 Tons of GAS COAL, to be delivered between the 1st of July, 1911, and the 30th of June, 1912.
Further Particulars, with Forms of Contract and Tender, may be had on Application; and Sealed Tenders, marked "Coal," are to be Delivered to me at these Offices not later than Noon of Wednesday, the 3rd of May, 1911.
J. M. Veevers,
General Manager.
Gas Offices, Rochester,
April 20, 1911.

BOMBAY GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that an ORDINARY GENERAL MEETING of the BOMBAY GAS COMPANY, LIMITED, will be held at the Offices of the Company, on Thursday, the 11th of May, 1911, at Twelve o'clock at noon, to receive the Directors' Report and the Accounts of the Company for the Year ended the 31st of December, 1910, to declare a Dividend, and to elect Directors and Auditors in the place of those retiring.
The TRANSFER BOOKS WILL BE CLOSED from the 28th inst. to the 11th of May, both days inclusive; and the Dividends will be paid on the 1st of June next to the Shareholders registered at the date of closing.
Notice is Hereby also Given, that an EXTRAORDINARY GENERAL MEETING of the BOMBAY GAS COMPANY, LIMITED, will be held at the Offices of the Company, Moorgate Station Chambers, E.C., on Thursday, the 11th day of May, 1911, at 12.15 o'clock in the Afternoon, or so soon thereafter as the business of the Ordinary General Meeting shall be concluded, for the purpose of considering, and, if thought fit, passing the following Resolutions:
1.—That the Capital of the Company be increased from £250,000 to £300,000 by the creation of 10,000 new Ordinary Shares of £5 each.
2.—That the Directors be and they are hereby authorized to issue such shares by Tender or otherwise, at such time or times and to such persons as they may deem expedient, and, if thought fit, upon the terms that the full amount of each such share, together with any premium thereon, shall be payable immediately upon allotment.
By order of the Board,
A. Dickson, Junr.,
Secretary.
Offices: Moorgate Station Chambers,
London, E.C., April 13, 1911.

ILFRACOMBE GAS COMPANY.

SALE BY TENDER OF FOUR PER CENT. DEBENTURE STOCK.

THE Directors of the above Company are prepared to receive, at the Offices of the Company, not later than Ten a.m., on the 15th of May, 1911, Sealed Tenders for £2750 nominal value DEBENTURE STOCK, bearing interest at the rate of 4 Per Cent per Annum (payable half-yearly), for the purposes of repaying similar stock maturing on the first of July, 1911, and for other purposes of the Company. The whole to be repaid at par on the 1st of July, 1921.
The Stock will be offered in lots of £50, at a Minimum Price of £50 each; and Tenders may be sent in for any number of lots.
Full Particulars, with Forms of Tender, may be obtained upon Application to the undersigned.
By order of the Directors,
A. Norman,
Secretary.
Gas Offices, 69, High Street, Ilfracombe,
April 19, 1911.